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PROJECT PRIME

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PRIORITY MANAGEMENT EFFORTS

TO IMPROVE DEPARTMENT OF DEFENSE
RESOURCE MANAGEMENT SYSTEMS

See article, "Planning-Programming-Budgeting Systems and Project PRIME," beginning on page 1.

Departing Assistant Secretary Sylvester Cites Industry's Support of Bulletin

As I prepare to leave the Department of Defense, I want to take this opportunity to express my appreciation to all the members of industry—both management and labor—who have supported the *Defense Industry Bulletin.*

In the first issue of the *Bulletin,* which appeared two years ago this month, I stated that the publication was aimed at serving your needs and that we would look to you to help us guide its future course. Your response has indeed been gratifying with the result that our industry readership has expanded from 1,100 at the outset to over 9,000 copies with this issue.

I hope that in the years ahead your acceptance and support of the *Bulletin* will continue, and that through this partnership the value of the publication to the defense industry will be steadily enhanced.

Arthur Sylvester

Navy League To Sponsor Briefings and Exposition at Annual Meeting Feb. 8-10

"Oceans Unlimited" is the theme of the 1967 Sea-Air-Space Exposition and Briefings, sponsored by the Navy League of the United States, and the District of Columbia Council's 10th Annual Seapower Symposium to be held concurrently at the Sheraton Park Hotel, Washington, D.C., Feb. 8–10.

Industry and Government will exhibit the present and future in the technical research and development field related to the Navy/Marine Corps mission in sea, air and space. Representatives of the Naval Material Command will give presentations reflecting the Navy's latest thinking.

Industrial firms participating in the exposition have scheduled 42 technical briefings to be presented in the Exhibit Hall five times each morning and three times each afternoon. There will be no registration fee for military and Government personnel attending the industry briefings. Attendees at the morning briefings will be guests at a complementary luncheon to be held each day. Shuttle buses will operate daily between the Pentagon, Main Navy Building and the Sheraton Park Hotel. For additional information concerning the industry technical briefings contact: Commander Holmgaard, Office of the Chief of Information, Department of the Navy, Washington, D.C., (Area Code 202) OXford 5–5713.

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BULLETIN

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The purpose of the *Bulletin* is to serve as a means of communication between the Department of Defense (DOD) and its authorized agencies and defense contractors and other business interests. It will serve as a guide to industry concerning official policies, programs and projects, and will seek to stimulate thought by members of the defense-industry team in solving the problems that may arise in fulfilling the requirements of the DOD.

Material in the *Bulletin* is selected to supply pertinent unclassified data of interest to the business community. Suggestions from industry representatives for topics to be covered in future issues should be forwarded to the Business & Labor Division.

The *Bulletin* is distributed without charge each month to representatives of industry and to agencies of the Department of Defense, Army, Navy and Air Force. Requests for copies should be addressed to the Business & Labor Division, OASD(PA), Room 2E813, The Pentagon, Washington, D.C. 20301, telephone, OXford 5-2709.

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Planning-Programming-Budgeting Systems and Project PRIME

by

LCdr. Steven Lazarus, USN

PPBS stands for Planning-Programming-Budgeting Systems. These words have so pervaded Government in the last year that the letters used by themselves have come to suggest a magical panacea for all management ills. This is unfortunate. When a basically good idea is translated into a "buzz" word, it often suffers from distortion and misinterpretation. If it fails to solve all problems or live up to its inflated billing, it is abruptly discarded. Usually a critic is readily available to pronounce the epitaph—I told you it wouldn't work in the first place.

The purpose of this article is to place PPBS in perspective by briefly describing its historical antecedents in DOD; outlining the process as it was implemented and refined from 1961 to 1965; and, most importantly, describing the changes which are being made in it in DOD under the collective name of Project PRIME.

Historical Antecedents.

Control by Legislature. The framers of the Constitution were aware that the British Parliament in 1688 had abrogated the historic right of the king to raise armies in time of peace according to his own good pleasure. Motivated by the conviction that the American executive should be similarly deprived of the power to raise and the sole power to regulate fleets and armies, the founding fathers expressly provided in Article 1, Section 8 of the Constitution that Congress shall have the power to "provide for the common defense," "raise and support armies," "provide and maintain a navy," and to make all laws necessary to execute these powers.

This "control by legislature" over a single War Department seemed appropriate for the small permanent military establishment contemplated in 1787. But by 1793 the incursions of the barbary pirates had forced Congress to consider the construction of a fleet and the managerial difficulties connected with this enterprise led in part to the establishment in 1798 of the Department of the Navy.

Throughout the 19th century Congress continued to assert its primacy in military affairs through its control of the purse. The President had no statutory authority to act on budgetary matters and, although the Secretary of the Treasury received department estimates, he was required to transmit them to Congress without revision.

The century, however, had also seen a tremendous national expansion, and with the acquisition of territory, the increase in population, and the growth of industry had come a larger and increasingly more complex military establishment.

". . . Predecessors of the so-called technical and staff services of the Army became firmly established as statutory institutions in their own right and created major problems of coordination and command within the War Department itself. A similar trend toward a proliferation of specialties manifested itself in the Navy, culminating in 1842 with the establishment of the Bureaus which created the same kind of problems within that Department. . . ." [1]

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This organizational form accommodated neatly to the legislative tendency to control by means of hundreds of discrete and separate appropriations. As recipients of specific appropriations, the heads of special activities achieved an almost autonomous status. The content of such appropriations was frequently established through a process of personal negotiation between the chief of a bureau and influential members of the Congressional committees handling the appropriations.

Strengthening the Executive. It was the failure of these organizational structures and management practices during wartime that prompted reform. The managerial difficulties encountered during the Spanish American War led to Secretary of War Root's recommendations of 1903 which, among other things, resulted in the creation of the Office of the Army Chief of Staff. The vast increase in expenditures during World War I made it evident that budgetary reforms were necessary and Congress responded by enacting the Budget and Accounting Act of 1921 which concentrated the responsibility for preparation and transmittal of the executive budget in the hands of the President. By strengthening the executive, the legislative branch was inevitably acquiescing to the curtailment of its own power.

Throughout the 1920's and 1930's the movement toward a unified defense establishment grew stronger and, as Charles Hitch comments, the experience of World War II finally overcame the last opposition. It was also plain that Congress could no longer exercise effective stewardship over the defense establishment by parceling out hundreds of discrete appropriations and by counseling independently with dozens of separate

[1] *Hitch, Charles, "H. Rowan Gaither Lectures in Systems Sciences," 1965.*

military officials. Massive, world-wide, total war demanded integrated and coordinated planning, finding and execution.

Although it was a major step in the right direction, the National Security Act of 1947 proved not quite equal to these tasks and was, therefore, strengthened and amended in 1949. Title IV was added to the Act creating the Office of the Assistant Secretary of Defense (Comptroller) and providing for uniform budget and fiscal procedures throughout the Department. The position of Comptroller was held by W. H. McNeil for 10 years (1949–1959), a record for longevity at such a level. McNeil's skill and energy, coupled with his tenure, enabled him to build selectively upon the recommendations of the first and second Hoover Commissions to lay the foundation for modern financial management in DOD.

The Process from 1961 to 1965.

Relating Costs to Missions. McNeil accomplished much to bring order out of chaos in the DOD management control process, and the reorganizations of 1953 and 1958 further strengthened the position of the Secretary of Defense. The problem, however, was already moving beyond the new systems and structure. The Defense budget was gradually rising toward its current level, new weapon systems were becoming unimaginably expensive, and the quest for a rational method of making choices and balancing forces was becoming imperative.

Congress chafed at its inability to know what it was paying for. Ohio Congressman Clarence Brown, commenting on the 1952 Appropriation Bill, said, ". . . I speak as one of those who is not at all certain just what this Bill provides or what all the items in it mean. . . ." [2] By 1959, Congressman George Mahon, then Chairman of the House Defense Appropriations Subcommittee, was stressing the importance of looking at the Defense program and budget in terms of major military missions, and asking the Secretary of Defense "for more useful information and for a practical means of relating costs to missions. . . ."

Congress was not alone in recognizing these needs. Arthur Smithies, a noted economist, said in 1957, ". . . Neither the Congress, nor the President, nor I suspect the Secretary of Defense and the Service secretaries have the information needed to relate the financial figures in the budget to any meaningful concept of military effectiveness. . . ." [3]

In presenting the Army budget in 1960, General Maxwell Taylor described a mission-oriented budget in terms of six programs, and suggested horizontal cross-Service review. Perhaps the most articulate observer was Charles Hitch, Chief Economist of the Rand Corporation, who crystallized the problem in a book entitled, "The Economics of Defense in the Nuclear Age."

Hitch examined the method of budget formulation, known as the "budget ceiling" approach, which entailed a process of squeezing Service budget requests to make their total fit within an initial overall limitation established by the Bureau of the Budget acting for the President. He found that "its consequences were precisely what could have been predicted:

"1. Each service tended to exercise its own priorities:

"a. Favoring its own unique missions to the detriment of joint missions;

"b. Striving to lay the ground work for an increased share of the budget in future years by concentrating on alluring new weapon systems; and

"c. Protecting the over-all size of its own forces even at the cost of readiness. . . .

"2. Because attention was focused on only the next fiscal year, the services had every incentive to propose large numbers of 'new starts,' the full cost dimensions of which would only become apparent in subseqeunt years. . . .

"3. Almost complete separation between budgeting and military planning.

"a. These critically important functions were performed by two different groups of people. . . .

"b. Budget control was exercised by the Secretary of Defense, but planning remained essentially in the services. . . .

"c. Whereas the planning horizon extended four or more years into the future, the budget was projected only one year ahead. . . .

"d. Planning was done in terms of . . . outputs; budgeting . . . in terms of inputs. . . .

"e. Budgeting, however crudely, faced up to fiscal realities; the planning was fiscally unrealistic, and therefore of little help to the decision-maker. . . .

"f. Military requirements tended to be stated in absolute terms, without reference to their costs." [4]

FIVE YEAR DEFENSE PROGRAM*

New	*Old*
I. Strategic Forces	Strategic Offensive Forces
II. General Purpose Forces	Continental Air & Missile Defense Forces
III. Specialized Activities (Includes MAP)	General Purpose Forces
IV. Airlift and Sealift	Airlift/Sealift Forces
V. Guard and Reserve Forces	Reserve and Guard Forces
VI. Research and Development	Research and Development
VII. Logistics	General Support
VIII. Personnel Support	Retired Pay
IX. Administration	Military Assistance

* For explanation of changes, see DOD publication, "A Primer on Project PRIME," Nov. 1966, pp. 34–35, available from the Office of Asst. Secretary of Defense (Comptroller), Room 3B857, The Pentagon, Washington, D.C.

Figure 1.

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[2] *Kolodziej, Edward A., "The Uncommon Defense and Congress" 1945-1963.*

[3] *NAVEXOS P–2416, Aug. 1962.*

[4] *Hitch, Charles J., "Decision Making for Defense," Berkeley: 1965, pp. 24–26. For further discussion of these same points, see David Novick (editor), "Program Budgeting: Program Analysis and the Federal Government," Cambridge: Harvard University Press, 1965, pp. 81–119.*

New Guidance. In 1961, President Kennedy abandoned the budget-ceiling approach as far as Defense was concerned. He gave his new Secretary of Defense, Robert McNamara, two general instructions:

- Develop the military force structure necessary to support our foreign policy without regard to arbitrary budget ceilings.
- Procure and operate this force at the lowest possible cost.

Charles Hitch became McNamara's Assistant Secretary of Defense (Comptroller) and clearly stated what was required to translate this guidance into action:

"We need an economically realistic future program so that long-lead decisions on program components will have a reasonable chance of turning out to be right. To develop such a program, it is essential that the decision makers have before them the total cost implications of alternatives —not only total in the sense of cutting across appropriation categories, but also in the sense of being projected forward over a five-year period." [5]

Hitch, aided by some able systems designers, developed such a mechanism—the Five-Year Defense Program —in the phenomenal time of about six months. He also established two new organizational elements—a programming division to superintend the Five-Year Defense Program, and a systems analysis division to conduct analytic comparisons of alternative inputs to that program.

PPBS. The mechanism was a three-phase operation: planning-programming-budgeting. The first phase—planning and requirements determination—was to be a year-round operation initiated by the Joint Strategic Objectives Plan proposed by the Joint Chiefs of Staff. It was to consist of military economic studies which would compare alternative methods of accomplishing national security objectives to determine the one that contributes the most for a given cost or achieves a given objective for the least cost. Today these are commonly called cost-effectiveness studies or systems analyses.

The second phase—the programming system—integrated combinations of men, equipment and installations into program elements whose effectiveness could be measured as a whole and related to national security objectives. The B–52 bomber force with all its resources was one such element. The elements were aggregated into the major missions of the Defense Department. Each aggregation had a common set of purposes and could, for decision making, be treated as a whole. In 1965, there were nine such aggreations or programs (Figure 1).

A mechanism which allowed for continuous update and change was provided, and data were projected for eight years in the case of military forces, and for five years in all other cases. This immense amount of data under continuous change required computerization in order to remain manageable. The availability of modern data processing equipment made feasible what otherwise would have been an impossible task.

The budget process was not susceptable to rapid alteration and, therefore, remained structured in terms of object classes, vast accumulations of inputs such as military per sonnel, procurement, etc. It was necessary to translate the program into budget terms by means of a "torque conversion" or matrix which broke the program into various appropriations categories. The accounting systems of DOD were also aligned with the budget structure, and thus progress reporting related to the program had to be accomplished by means of special studies and separate reports. The programming system had filled a vital planning need but, as yet, was unable to serve the needs of field managers.

In 1965, Robert N. Anthony became Assistant Secretary of Defense (Comptroller). It was to be Anthony's task to build upon the foundation of the programming system and create within DOD a management control system which would serve the needs of managers at all levels from the Congressman to the corporal.

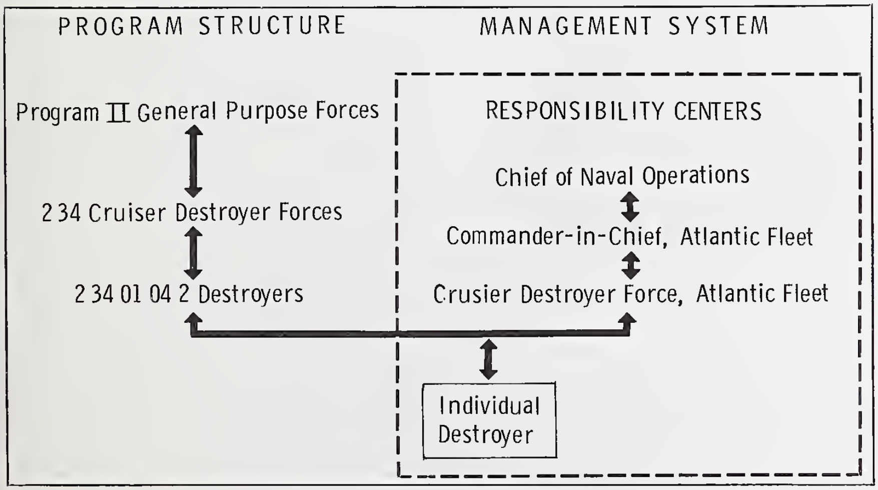
PROGRAM STRUCTURE
MANAGEMENT SYSTEM
Program II General Purpose Forces
2 34 Cruiser Destroyer Forces
2 34 01 04 2 Destroyers
RESPONSIBILITY CENTERS
Chief of Naval Operations
Commander-in-Chief, Atlantic Fleet
Crusier Destroyer Force, Atlantic Fleet
Individual Destroyer

Figure 2.

Project PRIME.

Progress Against Plan. In 1955, the second Hoover Commission on Organization of the Executive Branch of the Government made a series of recommendations for changes in accounting and budgeting procedures. Among these were suggestions that operating budgets be cost based and that Government accounting be kept on the accrual basis to show currently, completely and clearly all resources and liabilities, and the costs of operations. These particular recommendations were adopted and enacted in 1956 as Public Law 863.

As late as 1965, Charles Hitch had reflected that ". . . Ideally, I suppose, the program should be costed in terms of accrued expenditure, which is closest to the concept of resources consumed. However, the accounting difficulties appeared so overwhelming that we did not attempt that approach. . . ." [6]

Finally, President Johnson asked that the pace of the Joint Financial Management Improvement Program be accelerated, and in a special memorandum asked each agency to ". . . see that the Agency's managers are given the basic tools they need—responsibility centered cost-based operating budgets and financial reports. . . ."

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[5] *Ibid.*

[6] *Hitch, op. cit.*

Operating Costs. Anthony began by defining the problem in order to reduce it to manageable proportions. He identified two essential different types of cost—investment costs and operating costs—used in DOD management. Investment costs related to items such as ships, planes and facilities which maintained their identity during their cycle of use and were financed by means of "continuing" appropriations. These were planned for and managed on an individual item basis. They were treated consistently in both programs and budget and, thus, no significant changes were contemplated in their case.

Full attention was then focused on operating costs—the costs of the labor, materials and services required to operate the Defense establishments.

The first goal was to achieve a correspondence in terms of operating costs among program, budget, accounting system, and reporting system. Such consistency would eliminate the necessity for the unrewarding process of "torque conversion," would lay the groundwork for budget submission to Congress in mission-oriented terms, and would create within the accounting system the capability for progress reporting back against the program.

In order to do this, a single entity would have to serve as the basic unit, or building block, of both program and management system. This was achieved by revising the content of the Five Year Defense Program and defining program elements very carefully. The revised program structure is shown in Figure 1. The synchronization is demonstrated in Figure 2.

The second goal was to charge an organization with 100 percent of the measurable expenses that it incurred, and to account thereafter in terms of expenses. Such an accounting would yield hard, actual and total cost data to the planners working on revisions to the program and, simultaneously, would display to the manager the full cost of his activity. It would, additionally, show the Congressman what his operating appropriations were buying. Finally, it would give managers throughout DOD the ability to determine the real costs of specific missions, to measure actual performance against planned performance, and to relate resources consumed to work done.

While rough approximations of these relationships could have been made in the past using statistical prorations and special studies, what was now proposed was to derive them routinely and accurately by means of a disciplined debit and credit accounting system.

Basically, four steps were necessary to accomplish this goal:

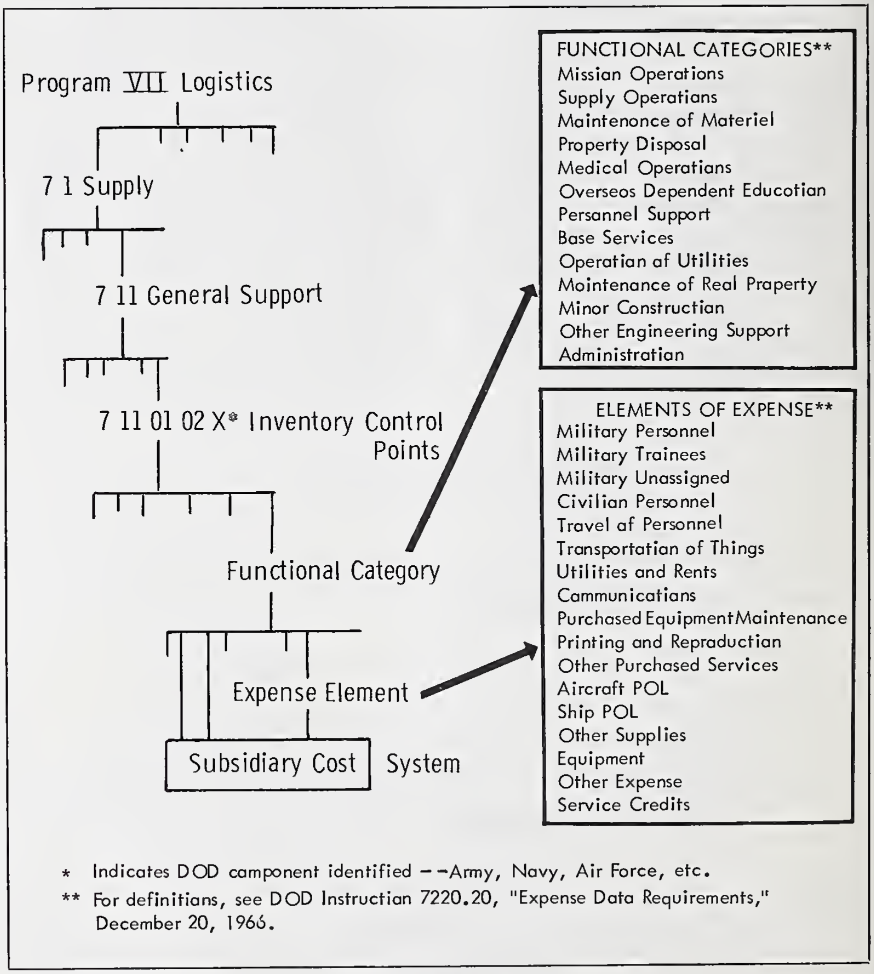
- Revise the accounts structure.
- Charge military personnel costs to organization units.
- Purify the appropriation definitions so as to include only items of an expense nature in the operating appropriation.
- Extend the use of working capital mechanism to encompass all items of an expense nature.

The Four Changes. A uniform account structure has been developed and will provide a common basis for the Military Departments and Defense Agencies to report expenses. It is only a skeleton and each DOD component has developed, or is developing, amplifying systems to meet its own management needs. The basic accounting structure ties directly back to the Five Year Defense Program as shown in Figure 3.

Functional categories will serve the purposes of functional managers and aggregate to program element. Expense elements will replace object classes as the basic modules in the accounting system. There will also be subsidiary cost systems such as one for wholesale supply depots which will subdivide functional categories into subfunctional breakdowns. Such breakdowns will supplement, but not replace, accounting by expense element.

Military personnel costs will be charged to the using activity by means of a standard cost. This will have the effect of costing at the user level the largest single category of operating resources not now so charged. It is hoped that DOD will be

(*Continued on Page 31*)



* Indicates DOD component identified --Army, Navy, Air Force, etc.

** For definitions, see DOD Instruction 7220.20, "Expense Data Requirements," December 20, 1966.

Figure 3.

Contractor's Weighted Average Share Concept

by

Robert D. Lyons

A novel procurement management concept known as the Contractor's Weighted Average Share (CWAS) is incorporated in Defense Procurement Circular No. 50, dated Dec. 30, 1966. This concept seeks to foster and rely upon the use of high-risk contracts to motivate prudent management decisions in the incurrence of costs. It is a management technique which enables the Government to identify and distinguish between high-risk and low-risk procurement environments by contractors' profit centers in a logical way, thus allowing a more discreet application of scarce resources. The underlying philosophy, objectives, mechanics and some of the benefits anticipated for both Government and industry will be discussed in this article.

DOD has made remarkable progress in the past five years in creating a new procurement environment within the defense industry complex. During this period the burden of risk has been substantially shifting from the Government to defense contractors through refinement in procurement techniques and the utilization of more firm fixed-price and incentive contracts, resulting in a dramatic reduction in the use of cost-plus-a-fixed-fee (CPFF) contracts from 36.6 percent of our procurement dollars in FY 1961 to 9.9 percent in FY 1966.

During the era of high CPFF contracting, many administrative, cost and audit controls were imposed on industry since this form of contracting did not provide sufficient motivation for prudent cost management on the part of contractors. As DOD moved further and further into the new procurement environment, however, it became increasingly apparent to many managers that our administrative practices were not attuned to the new situation. Thus, while encouraging contractors on the one hand to agree to higher-risk contracts, we, on the other hand, continued to do business in much the same old way. Now that there is an increase in the use of higher-risk contracts, it is considered feasible and desirable to measure the cost risk motivations imposed on individual contractors as evidenced by the mix of contracts being performed in a profit center and, whenever practical, to eliminate administrative controls and reasonableness overhead audits on those contractors who attain a verifiable "weighted average share" of risk which meets a prescribed threshold. This concept is based on the premise that good management by industry properly motivated to cost consciousness can accomplish much more effective control of costs than can detailed review, control and overhead audit by Government personnel. We believe that we can rely with confidence on the decisions of management in those profit centers which meet our prescribed "high-risk" standards.

The objectives of CWAS, as set forth in Defense Procurement Circular No. 50, are:

- To furnish a measure of an individual contractor's risk motivation, as provided by types of contracts, to conduct his business prudently and with maximum economy.
- To offer additional inducement to a contractor to accept higher risk type contracts.
- To minimize the extent of Government control, including controls exercised through DOD prime contracts and subcontracts thereunder, thereby reducing Government costs.
- To provide a simple, uniform procedure for determining a contractor's assumption of cost risk that can be applied equitably to all defense contractors who desire to participate by voluntarily submitting pertinent data.
- To provide a means for directing audit and other DOD management efforts to those areas where they are most needed because of a greater degree of Government risk.
- To provide a basis for determining that indirect costs, incurred during the applicable period by a contractor whose CWAS rating is above a predetermined threshold, are reasonable and, therefore, reimbursable if otherwise allowable and allocable.

Robert D. Lyons is Director for Procurement Management in the Office of the Assistant Secretary of Defense (Installations & Logistics). Prior to assuming this position in 1962, he served as Assistant Director for Procurement and Production with the Air Force Logistics Command. Mr. Lyons is a graduate of Harvard University and holds a Masters Degree in Business Administration.

The CWAS concept consists of two basic elements:

- The computation of a CWAS rating, i.e., the contractor's average share in cost risk. Each contractor will have his own CWAS rating for each profit center, and those with more than one profit center will also compute a corporate CWAS rating.
- The establishment of a threshold which will delineate the procurement environment and allow more discrimination in the use of DOD and contractor resources. The established threshold will apply to all qualifying contractors.

Defense procurement regulations contain many references equating contractor responsibility and costs of performance to types of contracts. A contractor having all his business with the Government on a CPFF basis is essentially different, in terms of motivation for cost control, from one having only competitive fixed-price business. Based on this premise, the technique for structuring CWAS is relatively simple, namely, measure the contractor's risk by applying simple weights to the type of contracts being performed in each profit center and the corporation as a whole. Thus we assign a zero percent weight to the CPFF contracts at one end of the spectrum and 100 percent to competitive fixed-price contracts and commercial business at the other end, and weight these by costs incurred. (Cost of sales may be substituted when appropriate.) Other types of contracts are scaled in between. Reasonable men could argue for slight variations but, in our judgment, the factors assigned to types of contracts are appropriate.

Application of CWAS.

The CWAS technique will be available to all contractors on a voluntary basis.

A contractor or subcontractor, desiring to participate, may do so by determining his own CWAS rating and submitting data for verification.

The Armed Services Procurement Regulation (ASPR) provides for validation of a CWAS rating by the Defense Contract Audit Agency, or an independent public accountant, and approval by the administrative contracting officer.

CWAS may be withdrawn pursuant to a finding of fraud, misrepresentation, or other abuse on the approval by the head of the procuring activity, and it may be denied under any circumstances by a decision at the Secretarial level.

Each Defense Contract Administration Services Region (DCASR) will maintain a register of CWAS ratings in its area and a master register will be maintained in Washington.

Procedure for Determining CWAS.

CWAS will be determined by the following method:

- Determine the total dollar costs incurred for commercial work and for the various Government specific types of contracts for the fiscal year just ended.
- Multiply these costs incurred by the approved percentage factor for the respective contract types. This becomes the contractor's "dollar cost risk."
- Total the resulting contractor dollar cost risks for the respective types of contracts and divide this result by the total dollar costs incurred.

The resulting percentage is the contractor's weighted average share in risk, or CWAS rating.

Approved Percentage Factors.

The percentage factors to be used in determining the contractor's dollar cost risk by type of contract are as follows:

Type of Contract	Percentage Factor
Letter Contracts, Time and Material, Labor Hour, Cost Only, CPFF	Zero
Cost Sharing	Share Line
Cost Plus Incentive Fee	15
Fixed Price Redeterminable (Retroactive)	50
Fixed Price Incentive (Successive Target)	55
Fixed Price Incentive (Firm Target)	Per Formula*
Fixed Price Redeterminable (Prospective)	80
Fixed Price with Escalation—Non-competitive	80
Firm Fixed Price—Non-competitive	80
Fixed Price with Escalation—Competitive	100
Firm Fixed Price—Competitive	100
Commercial	100

*Varies depending on ceiling and share line. A typical fixed-price incentive contract with a 118 percent ceiling and a 30 percent share would bear a factor of 65 percent.

CWAS Computation.

A simplified example of a CWAS computation is shown in Figure 1.

Based on this procedure, at some point on the spectrum from zero to 100, we can draw a line and be satisfied that we have identified and separated one meaningful procurement environment from the other. This line is referred to as the "threshold" and it is this threshold which will enable us to better utilize our management resources in the future to relate the degree of control with the need to control. When the threshold was developed, it was considered that a sound threshold would require the following characteristics:

- It would be low enough to have a significant impact in reduction of Government workload.
- It would be high enough to assure that contractor motivation could reasonably be relied upon.

As a result of a comprehensive study of 568 separate profit centers with approximately $20 billion in Government contracts (including National Aeronautics and Space Administration, Atomic Energy Commission, etc.) and other rationale, an initial threshold of 65, with a discretion band (CWAS subject to Government approval) in the range of 50 to 64, has been adopted. The CWAS threshold may be viewed graphically as shown in Figure 2.

A contractor having a 50 percent CWAS rating can be said to have one of his own overhead dollars involved with each Government overhead dollar expended. This rationale can be relied upon to stimulate prudent contractor management of overhead expenditures. At 65 percent, a contractor has two dollars at issue for every Government dollar, in which case there is a strong presumption of prudent management influence. Thus the selection of the 65 percent CWAS threshold was purposely directed toward initiating the CWAS program on a conservative basis. A large percentage of smaller and intermediate companies can be expected to qualify initially,

Type of Contract	*Prior Year's Costs Incurred*	*Percentage Factor*	*Contractor's Dollar Risk*
Time and Material	$ 50,000	0	$ 0
Cost Plus Fixed Fee	200,000	0	0
Cost Plus Incentive Fee	300,000	15	45,000
Fixed Price Incentive (118 percent Ceiling, 30 percent Share)	200,000	65	130,000
Firm Fixed Price, Competitive	100,000	100	100,000
Commercial	150,000	100	150,000
	$1,000,000		$425,000

$425,000 ÷ $1,000,000 = 42.5 CWAS rating

Figure 1.

while a smaller percentage of the large profit centers may qualify. The threshold, of course, can be adjusted with experience.

It should be emphasized that CWAS is based on risk as expressed by the preferred types of contracts authorized by ASPR. CWAS also recognizes the force of price competition by assigning a 100 percent factor to fixed-price competitive contracts as against an 80 percent factor for fixed-price non-competitive negotiated contracts. Further, before CWAS becomes operable, 35 points or more of the overall rating must be derived from competitive firm fixed-price contracts and commercial sales.

We believe that the most beneficial results of CWAS will derive initially in providing a basis for determining the reasonableness of certain indirect costs. These are, for the most part, those for which we have previously set limitations because of our preoccupation with the CPFF environment. However, it will be useful for other items, the reasonableness of which are difficult to judge as, for example, salaries and fringe benefits. It should be clearly understood that CWAS applies only to indirect costs and audits will still be performed, when appropriate, to assure that costs have, in fact, been properly incurred and are lodged in the proper accounts and are allocable. In short, CWAS is a test of reasonableness for certain specified indirect costs. It should result in eliminating uncertainties and inequities, and permit a more consistent and uniform approach in the future to the treatment of certain portions of overhead.

It should also be emphasized that CWAS is applied to a profit center as a whole, not to individual contracts within a profit center. This is essential since the indirect expenses of a profit center are allocated to all work in the profit center and can only be controlled effectively by an overall control. Indirect expenses generally are not controllable on a contract-by-contract basis. CWAS is either applicable to all contracts or none in a given profit center. CWAS in this respect can be described as a workload management technique; it should permit us to redirect our efforts toward those contractors engaged primarily in low-risk contracts.

A new ASPR paragraph 15–201.3 (b) provides direction for the application of CWAS as a test of reasonableness of certain indirect contract costs. The applicablility of CWAS to selected costs is provided in changes to paragraph 15–205. Those cost principles, which are designated "defer," are currently under consideration for revision by the ASPR Committee. The application or non-application of CWAS to such costs will be provided subsequently when these revisions are approved for printing. Pending such determination, CWAS shall not be used as the sole test of reasonableness in connection with such deferred costs. In the event the reasonableness of a CWAS-designated cost is predeterminded by advance agreement, such agreement will govern allowability for the remainder of the term of the agreement.

This concept will also be applied to relaxation of certain administrative controls but this will represent a long-term effort. There are proposals presently before the ASPR Committee to make CWAS applicable to indirect overtime, review of contractors' procurement systems, and consent to subcontracting. We have concluded, however, after lengthy study and some selected tests on "disengagement" conducted by the Air Force, that the problem of over-control—and, hence, indiscreet use of Government personnel and money—is sourced principally in administrative documents other than the ASPR. We think CWAS can be of assistance particularly in those areas where controls or marginally effective Government reviews are typically applied across the board without adjustment to give recognition to the contractor's business environment. Without something like CWAS, we really don't have any practical way to direct the efforts of our own professionals to the Government's best advantage, nor do we have a means of insuring consistent treatment as between different contractors.

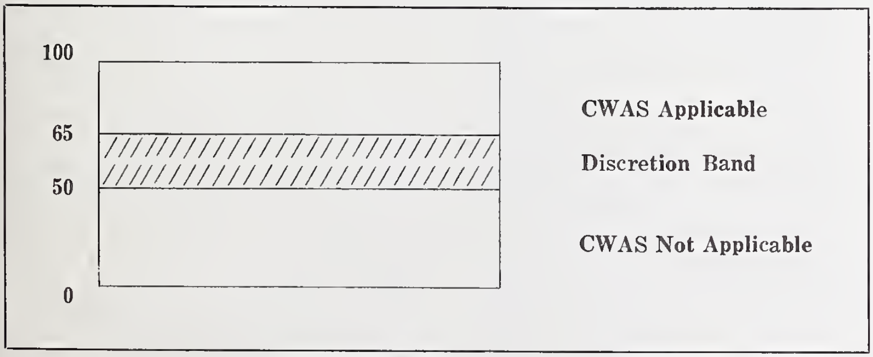


Figure 2.

Accordingly, under the aegis of a revised DOD Directive 5126.34, dated July 27, 1966, we are planning to initiate a Contract Administration Review Program in calendar year 1967 to encompass both the National Plant Cognizance plants and the DCASR's. The Military Departments and the Defense Supply Agency are now coordinating proposals for this effort and a DOD program manual has been prepared for internal and uniform guidance for these professional review teams.

The manual incorporates the CWAS concept, but the application has been somewhat modified. We intend to differentiate between high-risk, intermediate and low-risk procurement environments. This is readily determinable in a National Plant and can be accomplished on a sampling basis in the DCASR's. We will use this concept to query why various controls, reviews and procedures have been established for differing procurement situations. If a review team finds, for example, that controls designed for a low-risk procurement situation are also being applied to high-risk contractors, it will make strong recommendations for disengagement and better utilization of our resources. Hence CWAS, in this context, provides us with a very useful device for the first time in determining why we should or should not be doing certain things in our field administration. We look for evolutionary improvement in this important management area.

We are confident that industry will cooperate in the CWAS program and that DOD personnel will continue to identify other procurement and contract administration areas that may be candidates for this concept. CWAS should eventually be useful as a guideline in other DOD functional endeavors as it is better understood for it is a work management technique inherently related to risk.

GAO Urges Improved Contractor Estimating Systems

by

Stewart Collins
Directorate for Audit Systems
Office of Asst. Secretary of Defense (Comptroller)

In a briefing given to key officials of the Office of the Secretary of Defense on Nov. 2, 1966, representatives of the General Accounting Office (GAO) encouraged the Defense Department to take leadership in a program for improving and formalizing contractor estimating systems. GAO's interest in contractor estimating systems arose from a survey of the Defense Contract Audit Agency which has responsibility, under the Armed Services Procurement Regulation, to establish and manage a program to review contractor estimating systems.

The tabulation in the chart below, taken from one of several charts exhibited during the briefing, typifies the conditions found by the GAO in its survey regarding estimating systems. Some contractors had fairly well developed systems, while others had little or no written guidance or methods for estimating.

The GAO position was that any contractor should, as a matter of sound business practice, have a good estimating system. In essence, GAO officials stated that estimating systems would help the contractor manage the preparation of his proposals, and that DOD should place more emphasis on determining how well the contractor is doing this rather than reviewing the contractor's proposals in more detail than would otherwise be necessary.

Some of the points made during the briefing were:

- Because of the financial stake industry has in the outcome of its contracts, top management, as well as the stockholders, should have a vital interest in a well developed estimating system for preparation of price proposals.
- Where the estimating process is poorly designed or described, both the contractor and DOD should be concerned about what governs the quality of the cost and pricing data found in the proposals.
- Proper management should provide that all important procedures and methods be reduced to writing and periodically tested to assure compliance and effectiveness, and that management policies are being carried out at all levels of the organization.
- Although interpretative and ad-

ANALYSIS OF CONTRACTORS' WRITTEN ESTIMATING SYSTEMS

	Contractor A	Contractor B	Contractor C
• Company has policy statement.	Yes	Yes	Yes
• Pinpoints responsibility for:			
• Origination of estimates.	Yes	Very generalized	No
• Review of estimates.	Yes	Very generalized	No
• Approval of estimates.	Yes	Very generalized	No
• Provides for coordination and communication of information between departments.	Yes	Yes	No
• Contains guidance for estimating cost and pricing data.	Describes the step-by-step preparation of the proposal, identifies which internal organization is responsible for performing each step, discloses the source of the data, and shows the various review and approval points. The steps, of which there are 147, include guidance for the following: • Preparation of bill of material. • Segregating of make-and-buy items. • Obtaining and reviewing quotations. • Prices for common hardware. • Establishment of labor operations. • Establishment of labor standards. • Basis for determining labor adjustment factors. • Development of overhead and G&A rates.	Little guidance, e.g., the sole guidance for estimates of material is to use firm price quotations "as appropriate."	No
• Requires management approval for significant deviations.	No	Yes	No

ministrative problems under Public Law 87-653 will probably continue for some time in the future, a well developed estimating system should reduce these problems. For example, estimating systems can increase the level of acceptance of proposals and help the contractor determine when, under his record-keeping system, he can assume full responsibility for the currency of his cost and pricing data.

- Well developed estimating systems would help the contractor arrive at the lowest possible price he can quote in a competitive situation. In view of the DOD trend toward obtaining more competition, this would enhance the contractor's ability to obtain work under competitive conditions.
- With respect to review and negotiation of prices, the lack of acceptable estimating systems can result in numerous unnecessary questions by the auditor, technical personnel and negotiators, the resolution of which both frustrates and lengthens the review and negotiation process. Acceptable estimating systems would tend to reduce these questions and the amount and length of audit. This shortening of the procurement process would, in turn, help to minimize the need for updating of proposals.
- The contractor's estimating processes need not be explained on each and every proposal. Instead, comprehensive reviews of estimating systems, which are fully integrated with reviews of individual proposals, would be a more practical way of reviewing the contractor's estimating process.
- The resultant improvement in data in pricing proposals could help to reduce the number and depth of post-award audits by both DOD and GAO.

It was emphasized that an improved estimating system should not be considered as a substitute for a proper audit or for compliance with the requirements of Public Law 87-653.

Formal estimating systems, it was pointed out, would not, as some contractors have contended, reduce flexibility or the exercise of judgment in submitting proposals to the Government. On the contrary, the estimating system could be flexible enough to fit the type of procurement and actually give management a better basis upon which to make judgments. Further, it was noted that no one uniform method of estimating was contemplated and that each contractor could have complete freedom to develop his estimating system in such a manner as to meet certain minimum standards of acceptability, taking into consideration such things as the nature and size of his business, type of organization, and method of record keeping.

GAO recognized that improved estimating systems would not solve all procurement and audit problems, but they would make life a little easier for everyone concerned.

Organizational Changes Effected in OASD (I&L)

Changes in the organizational structure of the Office of the Assistant Secretary of Defense (Installations and Logistics)—OASD(I&L)—became effective Dec. 19, coinciding with the departure of Robert C. Moot, Deputy Assistant Secretary of Defense (Logistics Services). Mr. Moot has been appointed Deputy Assistant Administrator of the Small Business Administration.

The transportation and warehousing, telecommunications, cost reduction, and food service areas of OASD (I&L), which were under the direction of Mr. Moot, will be assigned to Deputy Assistant Secretary Paul H. Riley. Mr. Riley will also assume responsibility for technical data and standardization and will continue to be responsible for supply management activities.

Deputy Assistant Secretary Glenn V. Gibson will assume responsibility for contract support services, formerly under Mr. Moot, as well as direction of all administrative activities for the Assistant Secretary. Mr. Gibson will continue to be responsible for international programs functions.

Major General A. T. Stanwix-Hay, who has served as the Special Assistant Secretary, has been designated a Deputy Assistant Secretary with responsibility for the functions of the weapons analysis and readiness component of OASD(I&L), previously under the supervision of Mr. Riley.

Eckard Bennewitz, former Director of Weapons Analysis and Readiness, has been assigned as the Special Assistant to the Assistant Secretary.

PROJECT HINDSIGHT AN INTERIM REPORT

The first interim report on the findings of Project Hindsight, a two-and-one-half-year study of the utilization of results from research in science and technology, has been issued by the Director of Defense Research and Engineering.

Authorized contractors may obtain the Project Hindsight interim report (Order No. AD 642-400) without charge from the Defense Documentation Center, Cameron Station, Alexandria, Va. 22314. It can also be purchased from the Clearinghouse for Federal Scientific and Technical Information, Department of Commerce, Springfield, Va., $1 per copy.

Project Hindsight, as the name implies, is a retrospective study of recent scientific and technological advances which have been used by DOD in weapon system developments. The study is directed toward gaining a more objective understanding of DOD utilization of science and technology. Specifically, it is intended to determine procedures through which productivity of DOD's research and exploratory development programs may be improved.

Data for the Project Hindsight interim report was complied by teams of in-house scientists and engineers working with defense contractors who volunteered their assistance. Available detailed information supports the following general conclusions:

- Successful engineering design of advanced weapon systems primarily consists of skillfully selecting and integrating many elements from diverse technologies so as to produce the high performance demanded.
- At least in the systems studied, the contribution from post-1945 research efforts in science and technology were greatest when those efforts were oriented toward defense needs.
- Production of scientific and technical information utilized in weapon systems has been substantially more efficient when research efforts were funded and managed by DOD or defense contractors for DOD purposes, than when funded and managed by the non-defense sector of Government or industry without specific concern for defense needs.
- For the systems studied, approximately two-thirds of the innovations essential to the successful development of those systems were available at the time engineering design was initiated.
- The DOD investment in science and technology has had a demonstrably large payoff in terms of the resultant weapon system cost effectiveness.

ABOUT PEOPLE

DEPARTMENT OF DEFENSE

The President has announced the resignation of **Arthur Sylvester**, Asst. Secretary of Defense (Public Affairs), to be effective Feb. 3. In making the announcement, the President stated that he intended to nominate **Phil G. Goulding**, now Dep. Asst. Secretary of Defense (Public Affairs), as Mr. Sylvester's successor.

Gordon H. Tyler, who has been serving as Asst. Dir. of Procurement (Policy & Review) of the National Aeronautics and Space Administration, has been selected for the position of Executive Secretary of the Defense Industry Advisory Council.

Maj. Gen Autrey J. Maroun, USA, has been designated Dep. Asst. Secretary of Defense (Reserve Affairs), Office of Asst. Secretary of Defense (Manpower).

Col. Richard M. Scott, USAF, has been assigned as the Principal Military Asst. to the Asst. Secretary of Defense (Atomic Energy).

Col. James S. Douglas, USA, has has been assigned to the Business & Labor Div., Directorate for Community Relations, Office of Asst. Secretary of Defense (Public Affairs).

The following assignments have been made by the Defense Supply Agency:

Col. Cloyd L. Abney, USAF, Dir., Procurement & Production, Defense Industrial Supply Center, Philadelphia, Pa.; **Col. James R. Root**, USAF, Dir., Commodity Procurement & Production, Defense Fuel Supply Center, Alexandria, Va.; **Col. Francis P. Fitzgerald**, USAF, Dir., Procurement & Production, Defense General Supply Center, Richmond, Va.; **Col. Kenneth A. Young**, USAF, Dir., Technical Operations, Defense Construction Supply Center, Columbus, Ohio; **Col. Robert B. Ladd**, USAF, Commander, Defense Depot, Ogden, Utah,

Col. Fred Capio Jr., USAF, has been named Chief, Material Management Div., and **Col. John W. Roberts**, USAF, has been named Chief, Airborne Systems Div., of the Defense Communications Agency Planning Group.

DEPARTMENT OF THE ARMY

Brig Gen. Tobias R. Philbin Jr., has been relieved by **Col. Harvey E. Sheppard** as deputy to the Army Materiel Command's Dep. for Research & Laboratories. Col. Sheppard, who has been Chief of the Army Materiel Command Life Sciences Div., will serve as acting deputy.

William A. Yauss has been named Chief of the Electrical Engineering Div., of the Army Mobility Equipment Command's Engineer Research & Development Laboratories, Fort Belvoir, Va.

W. Carter Hall has been promoted to the position of Chief, Research & Development Procurement Office, Army Mobility Equipment Command, Engineer Research & Development Laboratories, Fort Belvoir, Va.

Col. Nicholas C. Angel, has assumed command of the U.S. Army Electronic Proving Ground, Fort Huachuca, Ariz.

Col. Chester A. Hall Jr., has become Dir., Army Electronic Proving Ground Test Directorate, succeeding **Col. Willis E. Kooken.**

Col. Charles S. Johnson Jr., has been appointed Chief, Review & Analysis Div., Plans & Programs Directorate, Office of the Chief of Research & Development, Department of the Army.

Col. Chester H. Johnson has assumed duties as Dep. Commander, Army Weapons Command, Rock Island, Ill.

The following have been assigned to key posts with the Army's Strategic Communications Command: **Col. William Minton**, Dep. Chief of Staff/Operations, and **Col. E. J. Quashnock**, Dir. of Communications Engineering Department.

Col. Paul R. Sheffield will become Dep. Div. Engineer, Lower Mississippi Valley Div., Army Corps of Engineers, and Secretary, Mississippi River Commission, with headquarters at Vicksburg, Miss., on Feb. 15, 1967.

The following assignments have been made by the Army Missile Command, Redstone Arsenal, Huntsville, Ala.:

Col. John T. O'Keefe, Special Assistant to the Commanding General of the Army Missile Command; **Col. James N. Lothrop**, Project Manager, TOW Weapon System; **Lt. Col. Ed Rudd**, Project Manager, Pershing Missile System; **Lt. Col. Arthur G. Lange Jr.**, Project Manager, Sergeant Ballistic Missile System; and **Lt. Col. Elbert W. Powell**, new deputy to the Dep. Commanding General, Land Combat Systems; **Col. Sterling C. Holmes** Dir. of the Army Missile Command's Procurement & Production Directorate, vice **Col. Eugene J. McGinnis.**

DEPARTMENT OF THE NAVY

The following assignments have been made at the U.S. Naval Shipyard, Philadelphia, Pa.:

Capt. R. W. Miehe Jr., Production Officer; **Capt. G. B. Jones**, Planning Officer; **Capt. J. A. Cush**, Construction Program Manager; and **Cdr W. J. Sawtelle**, Repair Superintendent.

DEPARTMENT OF THE AIR FORCE

Col. Walter R. Taliaferro has been named Dir. of the Titan III Program succeeding **Col. David V. Miller.**

Col. Joseph L. Campbell has been assigned as Dep. for Civil Engineering, Space Systems Div., Air Force Systems Command.

Col. George G. Getz, has been assigned as Special Asst. to the Dep. for Communications Systems, Electronic Systems Div., Air Force Systems Command.

Col. Vasco E. Gulino, is the new Chief, Data Processing Div., Air Force Logistics Command Data Center, Wright-Patterson AFB, Ohio.

Col. Vernon R. Turner has been assigned as Dep. Asst. for Logistics Planning, Deputy Chief of Staff (Systems & Logistics) at USAF headquarters.

STRATCOM Headquarters Will Move to Arizona

Headquarters of the U.S. Army Strategic Communications Command (STRATCOM) will be moved from the Washington, D.C., area to Fort Huachuca, Ariz., with the move to be completed by mid-1967.

The move of STRATCOM headquarters is being made to provide a permanent station for the headquarters and to consolidate, in one location, all elements of the headquarters now scattered at several sites in the Washington area. The headquarters has a combined strength of about 800 military and civilian personnel.

The location of STRATCOM headquarters in existing facilities at Fort Huachuca, a communications-electronics post since 1953, provides an environment that will enhance the capability of STRATCOM headquarters to carry out its mission of directing the Army's portion of the world-wide defense communications systems.

Management Information Systems: The Lifeblood of Management

by

RAdm. T. J. Rudden, USN

No longer does a top manager have to make decisions based on intuition or ancient history. Now a wealth of projection techniques and automated data processing systems bring real time information to his finger tips. He can now be the leader of his organization and make decisions based on timely, accurate and reliable information. The purpose of this article is to show how the Headquarters, Naval Material Command (NAVMAT) utilizes management information systems to manage its business.

The business of the Naval Material Command (NMC) is to provide material support (ships, weapons, aircraft, etc.) to the operating forces of the Navy and the Marine Corps. These forces comprise the world's largest and most powerful Navy with about 1,000,000 sailors and marines, more than 900 ships of all types with no two precisely identical, and about 8,400 aircraft of 235 different types. Our missions require a highly mobile, world-wide, changing mix of weapons and equipment which can be tailored to meet any situation such as existed at Lebanon, the Cuban Crisis, and now in Vietnam with a long-range flow of material support 7,000 miles across the Pacific.

Some of our weapon systems, such as a ship, have a long life and high investment. Some carriers on the Vietnam station are now in their third war and older than most of their crew. These long-life systems must keep up with advances in technology to be responsive to new and changing requirements. A major fleet unit like a carrier has in it more material, more different kinds of things from more different places than any land vehicle, any aircraft, any rocket, any guided or ballistic missile, any artificial satellite, any space vehicle, or any other vehicle made by man. As just one example, the attack carrier U.S.S. Forrestal is about five city blocks long. It has more than four acres of deck. It is about as high, from keel to the top of a mast, as a 25-story building. It displaces about 78,000 tons fully loaded. It took 52,500 tons of steel, 200,000 rivets and 2,400 miles of welding. Yet, it is a high-yield investment in national security. It is highly mobile, an "instant air base" almost anywhere we need one with a speed in excess of 30 knots. It can launch 32 planes in four minutes with no question of national sovereignty or land base rights.

Navy material requirements are unique. We must operate not only on and under the sea but also over the beach and in related land operations, and also in air and space.

Our business of support to the operating forces is big business. NMC spends between $10 and $11 billion per year which is about $20,000 every minute, around the clock, around the calendar. This is about two-thirds of the total Navy budget and about 12 percent of the total Federal budget. Out of every $100 paid in Federal taxes, $12 goes to NMC. The supply inventory for our forces is over $9 billion, while the inventory of real estate (four and one-half million acres) and property and facilities is about $33.6 billion.

The management information environment includes the Navy's setting in the framework of the Federal Government and the information requirements of the President, Bureau of the Budget, Defense Department, Secretary of the Navy and Executive Assistants, and other executive departments and agencies whose work affects the Navy including the Congress and the General Accounting Office. In addition state and local governments, trust territories and foreign countries have information requirements which must be met. A multitude of laws and regulations also generate information requirements. Management information systems must provide for these requirements.

RAdm. Thomas J. Rudden Jr., USN, is Deputy Chief of Naval Material (Programs and Financial Management). He has served with the Naval Material Command since 1964, first as Deputy Commander, Antisubmarine Warfare Systems Project. Later he was given responsibility for developing the organizational structure and concepts of operations of the Naval Ordnance Systems Command. He is a graduate of the U. S. Naval Academy, class of 1939.

The Management Organization and Philosophy.

The Chief of Naval Material (CNM) commands and manages six systems commands (Ships, Air, Supply, Facilities and Engineering, Ordnance, and Electronics) and managers of twelve projects, such as the Antisubmarine Warfare Systems Project and the Fleet Ballistic Missile System Project (Polaris and Poseiden) to mention two well known projects. Further, in this complex there are about 550 field activities (laboratories, shipyards, depots, etc.) and about 370,000 military and civilian personnel in the headquarters and in the field.

The systems commands have the technical and engineering expertise of the Navy. They provide the technical support to projects including some they have established which are of lesser scope than the CNM projects. A problem in this connection is to preserve these technical resources and not disperse them among project managers. It is necessary to strike the best balance between the needs of the project and the capabilities of the commands.

In a very real sense, NMC can be equated to a corporate complex. The six systems commands are the technical managers for the work for which they are responsible. Viewed in this manner, the CNM and his staff (NAVMAT) act as corporate headquarters and, as such, manages the managers. NAVMAT is a management and control organization. In this role it ties together the systems commands by:

- Allocating resources to them—resources management of manpower, real property, weapons, services, materials, supplies and funds.

- Assuring that planning and programming are applied comprehensively and cohesively.
- Setting goals and objectives for NMC as a whole.
- Standardizing and testing the adequacy of management systems.
- Assuring that contracting and procurement policies are developed and applied across the board.
- Insuring that development programs meet our needs.
- Striking the best balance between the needs of systems commands and project managers.
- Evaluating logistical programs and efforts.

In summary, the CNM controls the management operations which govern the technical functions. He does this, basically, by policy enunciation and enforcement, establishing defined centers of authority and responsibility, through planning, and by acquiring good information for decisions.

The NAVMAT headquarters management structure is lean with a staff of five deputy chiefs (Planning and Financial Management, Procurement, Development, Logistic Support, and Management and Organization). The management functions of planning, organizing, directing, controlling and coordinating are carried out in detail by these five deputies. Their titles are explanatory of their functions. They operate on the CNM management philosophy that the role of the top manager is to create an environment within which all subordinate levels of management can work most effectively—to leave lower-level matters at lower-level management. This "hands-off" management philosophy is also applied to the administration of many contracts with industry.

Our job as managers is to monitor contractor performance. We should not, and we will not, do the contractor's management job for him. At the same time, we must know, and we will know in detail and in real time, how his performance is meeting our requirements over the period of the contract.

We are convinced that, with this management philosophy, we will get better naval weapons and equipments on a more timely basis for less cost. We are convinced that this philosophy takes fuller advantage of the best features of the American system of free enterprise, that it stimulates greater competition, that it provides for better incentives, and that it shifts risks from the Navy to the contractor, as it should do.

NMC Management Information Systems.

Everything that a manager does ultimately comes down to decision making, and the science of management is the art of organizing facts for the decision-making process.

In the management business facts are like ammunition to the infantry and like gasoline to the aviator. Without facts operation is not possible and the organization and the assimilation of facts is the area where the good manager exercises his greatest artistry.

The major leap forward in management technology has been in the business of assembly and retrieval of facts. The old-time managers used to keep everything in their heads, but no more. The complexities of managing NMC requires formally organized management information systems, both automated and manual, which are geared to providing managers at all levels:

- Information that will help them assure that resources are obtained and used effectively and efficiently in the accomplishment of their objectives.
- Data to support program proposals and requests for funds.
- A means of assuring that statutes, agreements with Congressional committees, and other requirements originating outside the DOD relating to resources are complied with.
- Information that is necessary to formulate objectives and plans, monitor their execution, and isolate problem areas with a factual basis for corrective action. The law of the exception applies here, namely, concentrate on those areas and facets which are above or below planned performance.

NMC now has 200 automated data processing management information systems with 2,500 reports and a larger number of manual systems at headquarters to enable its managers at all levels to carry out their responsibilities. Data processing has been centralized at the headquarters level in the NMC Support Activity. There are 300 people in the Data Processing Group and 19 computers. An example of a management information system handled by this group is the MCON (Military Construction) System of the Naval Facilities Engineering Command. This system collects costs for new construction, reflects work in place, reflects real property inventory, and provides input into the Integrated Program Management System.

Development of formal data systems has been a slow and evolutionary process within the systems commands and project manager offices. Initially manual systems, supported by large clerical organizations, maintained the material and financial records required to operate our various organizations. Systems were developed in support of specific functions and operated at specific levels of management. The introduction of tabulating equipment and

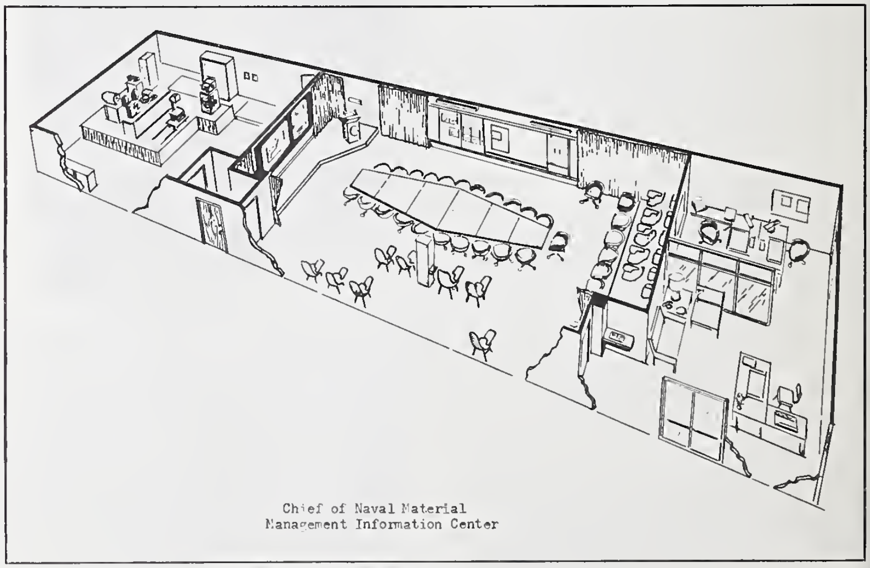


Figure 1.

the early use of computers reduced the clerical task and provided more information faster. The management process, however, required the reduction of voluminous reports to meaningful summaries for use in the decision-making process. Again, this was performed by manual clerical effort.

Within the last five years the introduction of more refined computer hardware and software has brought about data system development producing the entire span of management reports in support of a particular function. In some cases integrated data systems have been developed producing management reports for several functional areas and utilizing single point of entry (automatic feedback) of data from functional areas to centralized information processing. Specific examples are the Industrial Naval Air Station at Alameda and the Boston Naval Shipyard (developing Management Information System for Shipyards). The complexity of new weapon systems has generated the need for tremendous improvements in system techniques and ability to handle the increasing volume of associated data and management information.

The Department of the Navy's plan for introduction of automatic data processing equipment, as outlined initially in SECNAV Instruction P10-462.7 of April 16, 1959, has been closely followed in the mechanization of data systems within the NMC. Stage 5 (1960–65) of this plan called for

- The evaluation of our initial automatic data processing equipment installations; extension of early experience developed to all levels of activities.
- An awareness of the full potential of automatic data processing.
- A shift of application emphasis to the areas of planning, programming, scheduling, etc., in addition to the common uses stemming from reduction of clerical efforts.
- A shift in emphasis to more centrally developed programs in the design of more optimum management information systems utilizing operations research techniques.
- A maturity of hardware (third generation computers with improved input-output capabilities).
- The development of an overall Navy plan to bring about the complete transition of all resources to a full complement of information systems and hardware.
- Because of complexities in data and information systems design and the high costs involved, the NMC has not achieved all objectives of Stage 5 (1960–65). However, progress in both systems design and hardware installation indicates that complete achievement of Stage 5 objectives is feasible.

The requirements brought about by complexities of modern weapon systems have generated the need for a greater decision response capability at each management level. The ouputs of individual information systems developed by components of the NMC serve intermediate decision levels and culminate in management-by-exception reporting conducted through a complex of management centers. The CNM reviews the effectiveness of the NMC (on a weekly basis) at the CNM Management Information Center (MIC) through information provided manually by the complex of centers supporting each major management level. Similarly, the commands and project managers review the effectiveness of their programs in management information centers and, in addition, screen written reports, correspondence and other information flows.

The Management Information Center.

The information system currently supporting the CNM is determined by requirements generated for the weekly meetings in the CNM MIC. These meetings are chaired by the CNM and attended by the senior representatives of the first echelon line components of NMC. The Special Assistant to the Secretary of the Navy and/or a representative of the Office of Management Information are also in attendance. The format of these meetings cycles a status report from each of the major first echelon line components each month. In addition, the Management Information Division provides a series of key indicators on the overall status of the NMC to alert the CNM to possible danger signs. The information base that supports the center is built on existing information sources of the project managers and commands. Some of this information comes from mechanized systems but the majority is the result of manual efforts.

The MIC itself has a capability for viewgraph and slide projection, 16mm movies, conventional or closed circuit TV reception, conventional charts displayed on sliding panels or in permanent position and a large magnetic map for world-wide location of NMC interests. The slide capability provides for random access of 660 displays. Figure 1 shows the NMC MIC.

At the MIC the goal is "instant" management information. No matter what questions arise, or what information is needed, there is usually enough expertise and enough experience on hand to answer questions or provide information on the spot. There is no delay in the decision-making process while research is done, facts and figures checked, etc. There is an instant exchange of management ideas and instant consideration of multiples and complex interfaces among and between the headquarters of the NMC, systems commanders and project managers involving overlaps, non-contacts, conflicting requirements or priorities, etc. Instant management decision making is based on sound information and good communication with all pertinent factors considered. There are no study groups, lengthy exchange of memoranda or buck-passing. There is no procrastination. Everyone knows exactly who is in charge, who has principal action, collateral actions, when, where, why, how, etc. People in specialized areas get exposed to the "big picture" and how they fit in at these meetings. If our new A–7A aircraft requires something special in the way of facilities construction or equipment, the responsible people know about it immediately. There are no "surprises," and there is better integration and better coordination. The CNM management problem is a totally interrelated and interdependent end product, namely, the material support of the operating forces.

Specific guidance has been provided to those who present management reports to the CNM in NAVMAT Notice 5050 of April 1, 1966 as follows:

- Management reports made to the CNM should address any activity, event, or condition which has the potential or has already increased total program cost, delayed operational availability, delayed significant milestones, or degraded performance.
- Clearly defined plans, schedules and objectives should be the basis for portraying progress, for evaluation

of accomplishment, and for uncovering current or potential problems.

- In portraying information, the principle of management by exception should be followed. Unnecessary detail (clutter) should be avoided by the use of summary information whenever it accurately reflects the detailed facts.
- Where comprehensive coverage is being offered or required, selected visual aids should provide a means of addressing each of the basic management variables, i.e., performance, cost and schedule.
- Originals or reproductions of graphic aids of subordinate management information center or focal points are encouraged for use in the CNM MIC to the maximum extent.
- Each systems commander, deputy chief of naval material and project manager should continue to strive for consistency in information presented and uniformity of methods and techniques of presentations.
- Basic to the whole concept of performance presentation and appraisal during management reports is the continuing comparison of actual performance with the relevant plan, schedule, or objective.

Many of the reports made in the NMC MIC are repeated in the Secretary of the Navy's MIC and the Chief of Naval Operations MIC. The decision as to which reports should be presented are made during the Wednesday meeting of the CNM MIC.

The CNM has an established schedule of management information meetings. He has a daily staff meeting, except Wednesday, with his deputy chiefs who report briefly on major problems and significant upcoming actions. Guidance is given by the CNM with particular emphasis on actions expected that day. Each Friday, the CNM holds a meeting with the System Commanders Policy Council, a separate meeting with the Project Managers Policy Council and usually with the Secretary of the Navy. In addition, he meets frequently with the Deputy Chief of Naval Operations for Logistics when they iron out problems between the user and producer sides of the Navy's house.

Frequent meetings with industry round out the management information available to the CNM. The partnership with industry is indispensable to accomplishing the NMC mission of material support to the operating forces.

Management Information Systems Plans

We cannot stand still in this field of management information. We must continue to press the state of the art in management information systems sciences. An Information Sciences and Plans Branch has been established in the Management Information Division of NAVMAT for this purpose and is developing an Advanced Management Information System. Most management data systems operate at the hardware store level. Few, if any, function effectively at the level of strategic management decision making. We are trying to build a top level management information system. Among its techniques will be: simulation of alternatives, modeling and decision logic. If we are successful, we can forecast our problems. We can see them coming before they are on top of us. Possibly we should call this an "Early Warning and Calamity Avoidance" System.

There is a specific need to support the CNM and his deputies with an Advanced Management Information System. This need was supported by the findings of a study performed under contract for the CNM. The contractor's findings concluded that improvement was necessary and possible, and stated these principles and system characteristics for further development:

- The system must first satisfy requirements for information essential to the accomplishment of the mission of the CNM.
- It must be primarily responsive to the management information requirements of the CNM and his senior staff.
- It must support the task of control, i.e., the management functions of monitoring, evaluating, reporting, coordinating, establishing policy, guiding and directing.
- It should not duplicate other NMC systems.
- It will, therefore, generally be concerned with selected summary information produced to a large degree by the operating systems of lower echelons.

Further, it is the intent that any advanced system developed will support the CNM MIC in a "right-time" environment and utilize on-line display capability. It is further intended that any system developed will mutually support the first-line operating components of NMC and be compatible with their internal management information system.

The Management Information Division is responsible for directing and coordinating the development and implementation of an integrated management information system and services for NMC. In performing this responsibility the division operates with the designated functional management (information systems) organizations in NAVMAT; the management information systems organizations in each of the NMC systems commands and the project manager offices; and, through the commands, with the NMC field activities. The division director is the single point of contact within NMC for automatic data processing policy.

In accordance with the responsibility and the supporting goals of the Management Information Division, a management information system concept has been developed which has the following features:

- Systems will be designed to support the Navy Management Planning and Control System and the management system of each component of NMC. The information system will be designed to fit into its logical place in the total management system, e.g., where a cross relating of programs is required within NMC, the necessary coding and data element standardization is the responsibility of the Management Information Division. This situation will exist where weapons project management and resources management systems have interfaces. However, the goal is to obtain information requirements from both functional and project management components so that the interfaces are integrated into a coordinated management system and a coordinated supporting information system.
- The information required to perform the management mission of each echelon will be defined by that echelon. NMC operates with three basic echelons: NAVMAT, project manager/command and field activities. Separate information structures are associated with each echelon. Interlocking input data, records and files, and output reports are contained in the structures. The data and infor-

(*Continued on Page 16*)

BIBLIOGRAPHY

The publications listed below may be obtained at the following addresses:

Government Printing Office Publications

U.S. Government Printing Office
Washington, D.C. 20402

Research Reports

Authorized DOD contractors and grantees may obtain these documents without charge from:

Defense Documentation Center
Cameron Station
Alexandria, Va. 22314

Others may purchase these documents at the price indicated from:

Clearinghouse for Federal and Scientific Information
Department of Commerce
Springfield, Va. 22151

Government Printing Office Publications

MILSTRIP, MILitary STandard Requisitioning and Issue Procedures, Change 13, Aug. 1, 1966. Contains changes to MILSTRIP. 1966, 172 p. Catalog No. D 7.6/4:M 59/ch.13. $1.25.

RDT&E, Research, Development, Testing, and Evaluation at the U.S. Naval Oceanographic Office, 1960-1966. Covers the objective of the major projects within the program, some of the achievements obtained since 1959, the program's current status, and future plans. Technical detail has, for the most part, been avoided in the interest of providing material which would be of interest to the general reader as well as to the professional oceanographer. Catalog No. D203.2:R31 60¢.

Technology in Education. Contains testimony presented to the Subcommittee on Economic Progress of the Joint Economic Committee, U.S. Congress, regarding ways in which our industrial know-how is being adapted to the requirements of education. 273 p. Catalog No. Y 4. Ec 7:Ed 8. 65¢.

Research Reports

Research on Exhaust Gas Effects on Heat Exchangers. United Aircraft, for the Air Force, July 1966, 144 p. Order No. AD–637 952. $4.

Determination of Parts per Billion Iron in Hydrocarbon Jet Fuels. Monsanto Research Corp., Dayton, Ohio, for the Air Force, April 1966, 21 p. Order No. AD–636 604. $1.

Physical and Chemical Properties of JP–4 Jet Fuel for 1965. University of Dayton Research Institute, for the Air Force, Sept. 1966, 114 p. Order No. AD–640 937. $4.

Ignition and Combustion of Solid Propellants. University of Utah, for the Air Force, Sept. 1966, 94 p. Order No. AD–637 496. $3.

Compilation of Abstracts, 2nd AFOSR Combined Contractors Meeting on Combustion Dynamics Research. United Aircraft, Sunnyvale, Calif., and the Stanford Research Institute, for the Air Force, Oct. 1966, 82 p. Order No. AD–640 468. $3.

Investigation of the Autoxidation of Petroleum Fuels. Aberdeen Proving Grounds, Md., June 1966, 26 p. Order No. AD–641 270. $2.

Thermal Stability of Hydrocarbon Fuels. Phillips Petroleum Co., Bartlesville, Okla., for the Air Force, Sept. 1966, 270 p. Order No. AD–641 419. $6.

Physiological Methods in Astronautics. Translated from Russian by the Foreign Technology Div., Wright-Patterson AFB, Ohio, Aug. 1966, 303 p. Order No. AD–641 113. $7.

Aerospace Engineering 1966: The Proceedings of a Conference Held at the University of Maryland, March 15, 1966. Dept. of Aerospace Engineering, University of Maryland, for the Air Force, Sept. 1966, 159 p. Order No. AD–641 434. $5.

Storage Stability of Civil Defense Shelter Rations. University of Georgia, for the Army, Oct. 1966, 77 p. Order No. AD–640 823. $3.

Static and Dynamic Properties of Fire-Resistant Wooden Structural Elements. Naval Civil Engineering Laboratory, Port Hueneme, Calif., Oct. 1966, 70 p. Order No. AD–641 168. $3.

Creosoted Wood in a Marine Environment—A Summary Report. Naval Civil Engineering Laboratory, Port Hueneme, Calif., Sept. 1966, 33 p. Order No. AD–639 922. $2.

High Lift Surface Design Procedures Experimental Verification, Vol. 1, Summary and Evaluation. Northrop Corp., Norair Div., Hawthorne, Calif., for the Navy, May 1966, 76 p. Order No. AD–639 255. $3. Same title, **Vol. II, Theoretical Design & Analysis.** 126 p. Order No. AD–639 289. $4. Same title, **Vol. III, Wind Tunnel Tests.** 194 p. Order No. AD–639 191. $7.

An Experimental Parameter Study of the Fluid Force and Moment Response of Two Typical Ship Roll Stabilization Tanks. Southwest Research Institute, San Antonio, Tex., for the Navy, 60 p. Order No. AD–634 730. $3.

Rectilinear Fluid Flow Generator of Oscillating Type. Rensselaer Polytechnic Institute, Troy, N.Y., for the Navy, Aug. 1966, 21 p. Order No. AD–637 552. $1.

Collection and Analysis of Seismic Wave Propagation Data. University of Michigan, for the Advanced Research Projects Agency, Washington, D. C., Aug. 1966, 103 p. Order No. AD–640 212. $4.

Fictitious Data Generator for Analytical Aerotriangulation. Raytheon Co., for the Army, Oct. 1966, 83 p. Order No. AD–640 799. $3.

Protective Coatings for Magnesium. Naval Ordnance Laboratory, White Oak, Md., Sept. 1966, 43 p. Order No. AD–641 177. $2.

A Study of Electrodeposition of Organic Coatings for Possible Military Usage. Aberdeen Proving Ground, Md., Oct. 1966, 26 p. Order No. AD–641 314. $2.

Effect of Photodegradation of Attenuated Total Reflectance Spectra of Organic Coatings. Naval Civil Engineering Laboratory, Port Hueneme, Calif., Oct. 1966, 32 p. Order No. AD–640 733. $2.

Inorganic Coatings for Spring Applications. Springfield Armory, Mass., Oct. 1966, 53 p. Order No. AD–639 322. $3.

Testing of Chemical Films for Establishment of Revised Qualified Products List Under Specification MIL–C–5541A. Naval Air Engineering Center, Philadelphia, Pa., June 1966, 19 p. Order No. AD–637 696. $1.

Reactivation of Chromated Conversion Coatings for Maximum Paint Adhesion. Naval Air Engineering Center, Philadelphia, Pa., Sept. 1966, 16 p. Order No. AD–640 901. $1.

Determination of Parts per Billion Iron in Hydrocarbon Jet Fuels. Monsanto Research Corp., Dayton, Ohio, for the Air Force, April 1966, 21 p. Order No. AD–636 604. $1.

Physical and Chemical Properties of JP–4 Jet Fuel for 1965. University of Dayton Research Institute, Dayton, Ohio, for the Air Force, Sept. 1966, 114 p. Order No. AD–640 937. $4.

Ignition and Combustion of Solid Propellants. University of Utah, for the Air Force, Sept. 1966, 94 p. Order No. AD–637 496. $3.

Compilation of Abstracts, 2nd AFOSR Combined Contractors Meeting on Combustion Dynamics Research. United Aircraft Corp., Sunnyvale, Calif., and Stanford Research Institute, for the Air Force, Aug. 1966, 82 p. Order No. AD–640 468. $3.

Investigation of the Autoxidation of Petroleum Fuels. Aberdeen Proving Ground, Md., June 1966, 26 p. Order No. AD–641 270. $2.

Thermal Stability of Hydrocarbon Fuels. Phillips Petroleum Co., Bartlesville, Okla., for the Air Force, Sept.

1966, 270 p. Order No. AD–641 419. $6.

A Unified Approach to Energetics Research. Vol. I. Tyco Laboratories, Waltham, Mass., for the Air Force, Sept. 1966, 386 p. Order No. AD–638 362. $7. **Volume II** (same title). 305 p. Order No. AD–638 363. $7.

Study of Surface Properties of Atomically-Clean Metals and Semiconductors. Brown University, for the Army, Oct. 1966, 58 p. Order No. AD–639 345. $3.

Evaporated and Recrystallized CdS Layers. University of Delaware, for the Navy, Sept. 1966, 63 p. Order No. AD–637 725. $3.

Hot Electron Emitter. Hewlett-Packard Co., Palo Alto, Calif., for the Air Force, July 1966, 99 p. Order No. AD–639 568. $3.

Investigation of Solid State Devices and Materials. Northeastern University, for the Air Force, July 1966, 34 p. Order No. AD–635 287. $2.

Transistor Quality Statistics in a Pulsed Ionizing Radiation Environment. Hughes Aircraft Co., Fullerton, Calif., for the Navy, Sept. 1966, 84 p. Order No. AD–638 862. $3.

The Relations Between Electrical Noise and Dislocations in Silicon. Carnegie Institute of Technology, for the Navy, July 1966, 46 p. Order No. AD–636 520. $2.

Damping Capacity of Materials, Vol. I. Battelle Memorial Institute, Columbus, Ohio, for the Army, Oct. 1966, 391 p. Order No. AD–640 465. $7. **Vol. II** (same title). 394 p. Order No. AD–640 689. $7.

Crack Initiation in Fatigue of Metals. University of Texas, for the Air Force, Oct. 1966, 61 p. Order No. AD–640 419. $3.

Vanadium Alloy Studies. ITT Research Institute, Chicago, Ill., for the Navy, June 1966, 35 p. Order No. AD–634 827. $6.

Computer Routines to Read Natural Text with Complex Formats. Rand Corp., Santa Monica, Calif., for the Air Force, Aug. 1966, 141 p. Order No. AD–637 303. $4.

Studies in Speech Analysis and Synthesis. University of Michigan, for the Navy, Aug. 1966, 51 p. Order No. AD–640 406. $3.

On-Line Interactive Displays in Application to Linguistic Analysis and Information Processing and Retrieval. Systems Development Corp., Santa Monica, Calif., for the Advanced Research Projects Agency, Sept. 1966, 22 p. Order No. AD–640 647. $1.

Security in the Computer Environment. System Development Corp., Santa Monica, Calif., for the Air Force, Aug. 1966, 34 p. Order No. AD–640 648. $2.

The effect of Context on Recall and Recognition of Long Verbal Series. Air Force Systems Command, Decision Sciences Laboratory, June 1966, 22 p. Order No. AD–640 801. $1.

Design Problems in Visual Displays: Part II. Factors in the Legibility of Televised Displays. Mitre Corp., Bedford, Mass., for the Air Force, Sept. 1966, 72 p. Order No. AD–640 571. $3.

The Adsorption of Carbon Dioxide on Carbon Solids. Part I—Graphite and Diamond at 0°C. Naval Research Laboratory, July 1966, 18 p. Order No. AD–639 659. $1.

High Temperature Gas Refractometer. Block Engineering, Inc., Cambridge, Mass., for the Air Force, July 1966, 36 p. Order No. AD–637 235. $2.

Proceedings of the Fourth Symposium on Remote Sensing of Environment. University of Michigan, for the Navy and Air Force, June 1966, 908 p. Order No. AD–638 919. $8.75.

Proceedings of the 19th Annual Symposium on Frequency Control. Army Electronics Command, Fort Monmouth, N.J., 1965, 681 p. Order No. AD–471 229. $9.80.

Research on Thermionic Electron Emitting Systems. Varian Associates, Palo Alto, Calif., for the Navy, 1966, 100 p. Order No. AD–640 184. $4.

Research for Development of Epitaxial Techniques for use in Fabrication of Silicon Carbide Devices. Motorola, Inc., Phoenix, Ariz., for the Air Force, May 1966, 65 p. Order No. AD–635 136. $6.

An Experimental Evaluation of a Driver Simulator for Safety Training. George Washington University, for the Army, June 1966, 35 p. Order No. AD–636 166, $2.

Research on Exhaust Gas Effects on Heat Exchangers. United Aircraft Corp., for the Air Force, July 1966, 144 p. Order No. AD–637 952. $4.

Reorganization Effected at APGC

The Air Proving Ground Center (APGC), Eglin AFB, Fla., has shuffled its organizational structure to enable the center to more effectively and efficiently accomplish its assigned mission.

All APGC test management activities have been consolidated under the Deputy for Test, Col. R. L. Blachly. The Deputy for Test has been formally termed the Deputy for Test Operations.

In addition, the former Deputy for Effectiveness Test organization has become the Air Force Weapons Effectiveness Test (AFWET) Directorate assigned to the Deputy for Test Operations.

The AFWET Directorate, headed by Col. R. R. Moulton, conducts predictive analysis, designs tests, provides technical supervision of test conduct, analyzes the resultant data and reports on AFWET programs. The physical tests are carried out and supported by other Deputy for Test Operations directorates—the Electronics Test, Munitions Test, Aircraft and Missile Test, and the Test Operations Directorates.

APGC is responsible for Air Force weapons effectiveness testing, electronic warfare testing, non-nuclear munitions testing, and vertical probe operations.

Management Information Systems

(Continued from Page 14)

mation contained in each of these reflect three or more basic levels of summarization: total program status at the highest summary level; status of each major program at the highest summary level; status of each major supporting task at the highest summary level; etc., to the lowest common denominator of the work breakdown of the program which the management system provides.

The Management Information Systems Plan is the framework for directing and coordinating the information systems development program. It will also be the five-year systems improvement plan for NMC. Systems improvements by components of the NMC will be coordinated by the Management Information Division to ensure consolidation of an integrated data base to support the overall objective and the information and reporting requirements of the CNM. The 1967 Management Information Systems Plan (FY 1968) will be the second cycle of planning and stating information requirements. These stated requirements become the foundation and authority for automotive data processing equipment, program change proposals, and funds in the budget to implement new systems.

The Management Information Division, through use of the annual Management Information Systems Plan and an improved inventory of data systems, subsystems, and systems components, will guide the evolution of new systems within the components of NMC in order to provide for the most optimum balance between information to support each management level and costs associated with such systems.

The full benefits of the NMC reorganization of May 1, 1966, have not yet been realized nor have all the basic management philosophies been fulfilled. However, the goals and concepts have been formed and steady progress has been made. The needs of our operating forces shall be met!

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SSD: Space Systems Division
Air Force System Command
Air Force Unit Post Office
Los Angeles, Calif. 90045
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AERONAUTICAL PROGRAMS

Program No. and Title		System Program Director and/or Project Officer
129A	FB–111	Maj. Gen. J. L. Zoeckler ASD Ext. 53258
140A	AGM–69A (SRAM)	Col. Joseph Green ASD Ext. 55811
226A	AIM 7 D, E (Sparrow)	Mr. M. B. Rutstein ASD Ext. 55281
311A	AGM–12C (Bullpup B)	Lt. Col. William Monday ASD Ext. 52115
313A	AGM–45A (Shrike)	Lt. Col. William Monday ASD Ext. 52115
314A	AGM–62A (Walleye)	Lt. Col. William Monday ASD Ext. 52115
319A	AGM–65A (Maverick)	Lt. Col. Ward E. Protsman ASD Ext. 54568
321A	AGM–12B (Bullpup A)	Lt. Col. William Monday ASD Ext. 52115
324A/B	F/RF–111A (TFX)	Maj. Gen. J. L. Zoeckler ASD Ext. 53258
324K	F–111K	Maj. Gen. J. L. Zoeckler ASD Ext. 53258
326A/ 327A	F–4C RF–4C	Col. Charles Clemence ASD Ext. 64657
337A	A–7	Col. J. D. Hails ASD Ext. 67809
400H/K	HC–130H/ C–130K	Mr. Ray Carlson ASD Ext. 54010
410A	C–5A	Col. G. M. Townsend ASD Ext. 54301
420A/B	F–5A/B	Col. Mark Treat ASD Ext. 53356
443Q	UH–1F (AF)	(Vacant) ASD Ext. 55323
463L	Materials Handling	Col. D. W. Ewing ASD Ext. 52793
476L	C–141	Col. D. W. Ewing ASD Ext. 52793
482A	HH–53B	Lt. Col. F. L. Mosher ASD Ext. 52793
485B	CH–3C/HH–3E	Lt. Col. F. L. Mosher ASD Ext. 58480

BALLISTIC PROGRAMS

Program No. and Title		System Program Director and/or Project Officer
133A/B	Minuteman	Brig. Gen. A. W. Cruikshank BSD Ext. 6014
627A	ABRES	Brig. Gen. Kenneth W. Shultz BSD Ext. 7068

ELECTRONIC PROGRAMS

Program No. and Title		System Program Director and/or Project Officer
407L	Tactical Air Control System	Col. Spencer Hunn ESD Ext. 75–4954
416M	BUIC	Col. F. L. Ayres ESD Ext. 4101
418L	Ryukyu Air Defense System	Col. F. L. Ayres ESD Ext. 4101
433L	Weather Obs & Forecast	Lt. Col. Robert L. Houghton ESD Ext. 78–640
436L	North Atlantic Comm System	Lt. Col. Joe Maher ESD 78–680
439L	Sea Coastal Cable System (Seedtree)	Col. G. B. Hilton ESD Ext. 78–680
440L	Scatter OTH Radar	Col. Herbert Dotson ESD Ext. 2817
441A	AN/FPS 95 Radar	Col. Herbert Dotson ESD Ext. 2817
458L	European WB Transmission Media Improvement Program	Col. G. B. Hilton ESD Ext. 78–680
473L	HQ USAF Command and Control System	Col. R. L. Edge ESD Ext. 5354
474L	BMEWS	Col. Tom O. Wear ESD Ext. 2678
474N	SLBM	Col. Tom O. Wear ESD Ext. 2678
481A	Airborne Data Automation	Lt. Col. Barker ESD Ext. 85–4727
482L	Emergency Mission Support	Col. Spencer Hunn ESD MITRE Ext. 4954/4955
484L	Soft Talk	Col. R. L. Bell ESD Ext. 78–640
484N	Pacific Area Communications System	Col. G. B. Hilton ESD Ext. 78–680
486L	Mediterranean Communication System	Col. G. B. Hilton ESD Ext. 78–680
487L	Survivable Low Frequency Communications	Col. J. T. Tyler ESD Ext. 78–783/4/5
489L	Northern Area Communications	Col. G. B. Hilton ESD Ext. 78–680
490L	DCS Automatic Switch Voice	Col. G. B. Hilton ESD Ext. 78–680
491L	AUTOSEVOCOM	Col. R. L. Bell ESD Ext. 78–640
492L	US STRICOM Command & Control System	Col. D. W. Bowry ESD Ext. 5337
493L	Secure Voice SW Network	Col. R. L. Bell ESD Ext. 78–640
494L	ERCS	Col. J. T. Tyler ESD Ext. 78–783
495L	USAF G/A Program	Col. R. L. Bell ESD Ext. 78–640
496L	Space Track	Col. Tom O. Wear ESD Ext. 2678
	FRELOC-FASTRACE	Mr. George MouHon ESD Ext. 78–676
497L		Col. R. L. Bell ESD Ext. 78–640
499L	AIMS	Col. L. G. Blais ASD Ext. 54804

RECONNAISSANCE PROGRAMS

Program No. and Title		System Program Director and/or Project Officer
119N	RC–135A	Maj. Luther Jones ASD Ext. 52352

Program No. and Title		System Program Director and/or Project Officer
119P	RC–135C	Lt. Col. Clyde Bensey ASD Ext. 53053
428A	TIPI	Col. R. R. Frederick ASD Ext. 55116
466L	ELCO	Col. H. F. Dotson, Jr. ESD Ext. 2817

SPACE PROGRAMS

Program No. and Title		System Program Director and/or Project Officer
623A	Large Solid Propellant Motors	Col. Norman Keefer SSD Ext. 31106
624A	Titan III Space Booster	Col. W. R. Taliaferro SSD Ext. 30734

OTHER PROGRAMS

Program No. and Title		System Program Director and/or Project Officer
101A	B–52	Lt. Col. E. W. Geniesse ASD Ext. 55654
102A	B–58	Lt. Col. E. W. Geniesse ASD Ext. 55654
107C	Titan II	Col. Quentin J. Goss BSD Ext. 6804
110A	XB–70	Mr. John P. McCollom ASD Ext. 52230
131C	AGM–28/ TERCOM	Maj. W. S. Paul ASD Ext. 53504
201W	F–106 MOD 10001 (MA–I AWCIS Solid State Computer)	Mr. Dale Little ASD Ext. 54247
202A	ASG–18/ AIM–47A	Col. B. N. Bellis ASD Ext. 54734
208A	AIM 4B, C, D (Falcon)	Mr. E. C. Rado ASD Ext. 53800
221A	AIM 9B, D (Sidewinder)	Mr. M. B. Rutstein ASD Ext. 54556
303G	F–104G (MAP)	Maj. D. S. Kromer ASD Ext. 52326
306A	F–105D/F	Lt. Col. F. L. Cunha ASD Ext. 55237
332A	AGM–76A	Col. B. N. Bellis ASD Ext. 54734
334A	YF–12	Col. B. N. Bellis ASD Ext. 54734
420L	T–38	Col. Mark Treat ASD Ext. 53356
424L	T–37B/C	Lt. Danny R. Preble ASD Ext. 55068
429L	BQM–34A	Mr. Ray Dearbaugh ASD Ext. 34800
430A	Interim TIPI	Maj. J. W. St. John ASD Ext. 53324
478A	VTOL Util Trans (XC–142)	Lt. Col. William Carr ASD Ext. 53641
479A	Nike-Zeus Target	Col. J. A. Urban BSD Ext. 4029
628A	Agena D	Lt. Col. Cecil E. Riddle SSD Ext. 643–2228
629A	Standard Atlas	Col. Leo W. Sullivan SSD Ext. 643–1032
631B	Gemini (GLV)	Col. Robert R. Hull SSD Ext. 643–0366
632A	MOL	Col. William Brady SSD Ext. 643–0900
653A	X–15	Mr. Robert Clodfelter ASD Ext. 53805
680A	START	Col. Curtis L. Scoville SSD Ext. 32822
683A	Vela Satellite	Col. S. H. Sherrill SSD Ext. 643–3184
	SR71	Col. B. N. Bellis ASD Ext. 54734
	Scout	Lt. Col. Joe D. Johnston SSD Ext. 643–0024

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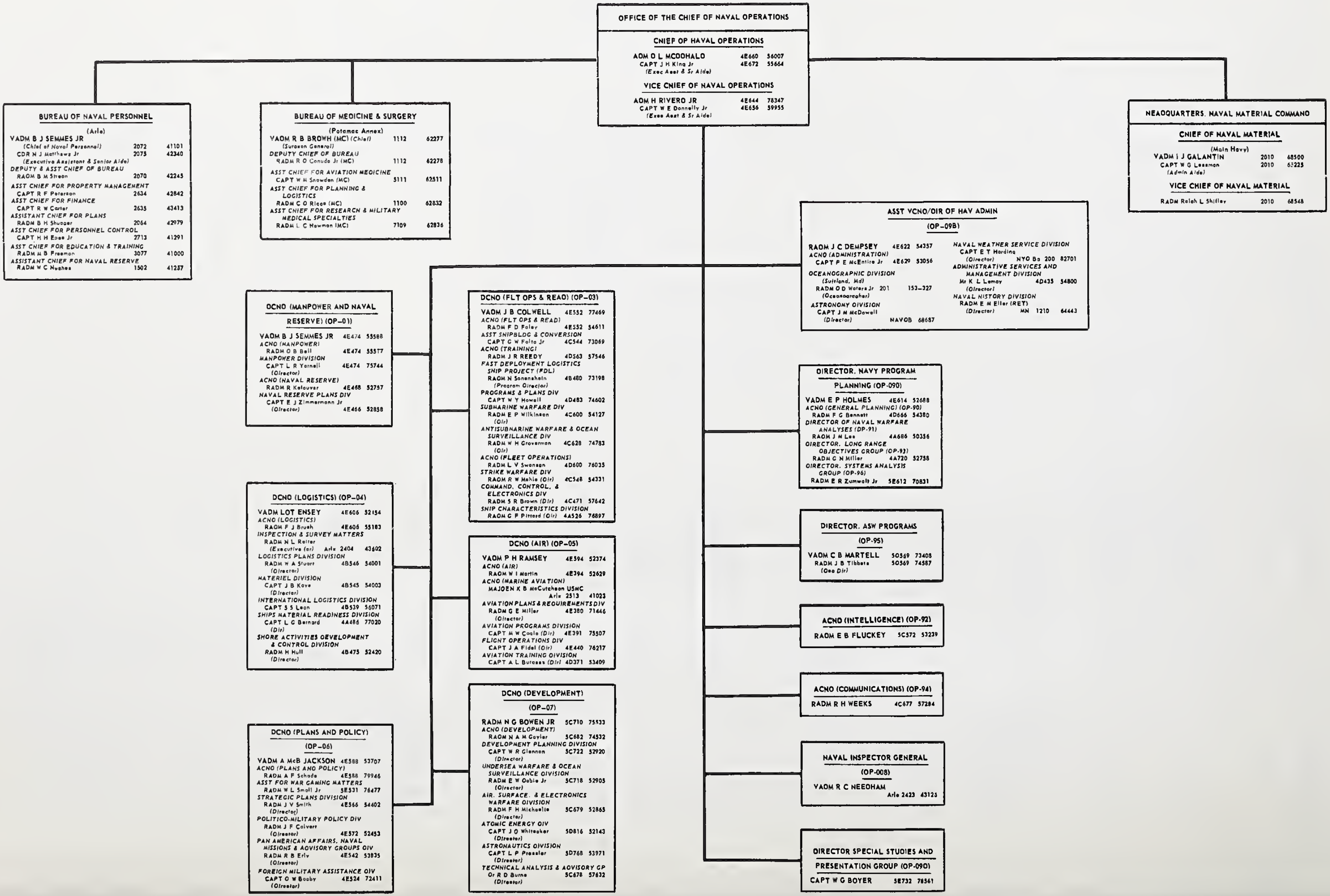

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ASTRONOMY DIVISION		
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RADM O B Bell	4E474	55577
MANPOWER DIVISION		
CAPT L R Yarnell (Director)	4E474	75744
ACNO (NAVAL RESERVE)		
RADM R Kelouver	4E468	52757
NAVAL RESERVE PLANS DIV		
CAPT E J Zimmermann Jr (Director)	4E466	52858

DCNO (FLT OPS & READ) (OP-03)

VADM J B COLWELL	4E552	77469
ACNO (FLT OPS & READ)		
RADM F D Foley	4E552	54611
ASST SHIPBLDG & CONVERSION		
CAPT G W Folta Jr	4C544	73069
ACNO (TRAINING)		
RADM J R REEDY	4D563	57546
FAST DEPLOYMENT LOGISTICS SHIP PROJECT (FDL)		
RADM N Sonenshein (Program Director)	4B480	73198
PROGRAMS & PLANS DIV		
CAPT W Y Howell	4D483	74602
SUBMARINE WARFARE DIV		
RADM E P Wilkinson (Dir)	4C600	54127
ANTISUBMARINE WARFARE & OCEAN SURVEILLANCE DIV		
RADM W H Groverman (Dir)	4C628	74783
ACNO (FLEET OPERATIONS)		
RADM L V Swanson	4D600	76035
STRIKE WARFARE DIV		
RADM R W Mehle (Dir)	4C548	54331
COMMAND, CONTROL, & ELECTRONICS DIV		
RADM S R Brown (Dir)	4C471	57642
SHIP CHARACTERISTICS DIVISION		
RADM C F Pittard (Dir)	4A526	76897

DCNO (LOGISTICS) (OP-04)

VADM LOT ENSEY	4E606	52154
ACNO (LOGISTICS)		
RADM F J Brush	4E606	55183
INSPECTION & SURVEY MATTERS		
RADM N L Reiter (Executive for)	Arlx 2404	43602
LOGISTICS PLANS DIVISION		
RADM W A Stuart (Director)	4B546	54001
MATERIEL DIVISION		
CAPT J B Kaye (Director)	4B545	54003
INTERNATIONAL LOGISTICS DIVISION		
CAPT S S Leon	4B539	56071
SHIPS MATERIAL READINESS DIVISION		
CAPT L G Bernard (Dir)	4A486	77020
SHORE ACTIVITIES DEVELOPMENT & CONTROL DIVISION		
RADM H Hull (Director)	4B475	52420

DCNO (AIR) (OP-05)

VADM P H RAMSEY	4E594	52374
ACNO (AIR)		
RADM W I Martin	4E394	52629
ACNO (MARINE AVIATION)		
MAJGEN K B McCutcheon USMC	Arlx 2513	41023
AVIATION PLANS & REQUIREMENTS DIV		
RADM G E Miller (Director)	4E380	71446
AVIATION PROGRAMS DIVISION		
CAPT M W Cagle (Dir)	4E391	75507
FLIGHT OPERATIONS DIV		
CAPT J A Fidel (Dir)	4E440	76217
AVIATION TRAINING DIVISION		
CAPT A L Burgess (Dir)	4D371	53409

DCNO (PLANS AND POLICY)

(OP-06)

VADM A McB JACKSON	4E588	53707
ACNO (PLANS AND POLICY)		
RADM A F Schade	4E588	79946
ASST FOR WAR GAMING MATTERS		
RADM W L Small Jr	5E531	76477
STRATEGIC PLANS DIVISION		
RADM J V Smith (Director)	4E566	54402
POLITICO-MILITARY POLICY DIV		
RADM J F Calvert (Director)	4E572	52453
PAN AMERICAN AFFAIRS, NAVAL MISSIONS & ADVISORY GROUPS DIV		
RADM R B Erly (Director)	4E542	53835
FOREIGN MILITARY ASSISTANCE DIV		
CAPT O W Bagby (Director)	4E524	72411

DCNO (DEVELOPMENT)

(OP-07)

RADM N G BOWEN JR	5C710	75533
ACNO (DEVELOPMENT)		
RADM N A M Gayler	5C682	74532
DEVELOPMENT PLANNING DIVISION		
CAPT W R Glennon (Director)	5C722	52920
UNDERSEA WARFARE & OCEAN SURVEILLANCE DIVISION		
RADM E W Dobie Jr (Director)	5C718	52905
AIR, SURFACE, & ELECTRONICS WARFARE DIVISION		
RADM F H Michaelis (Director)	5C679	52865
ATOMIC ENERGY DIV		
CAPT J O Whiteaker (Director)	5D816	52143
ASTRONAUTICS DIVISION		
CAPT L P Pressler (Director)	5D768	53971
TECHNICAL ANALYSIS & ADVISORY GP		
Dr R D Burns (Director)	5C678	57632

DIRECTOR, NAVY PROGRAM PLANNING (OP-090)

VADM E P HOLMES	4E614	52688
ACNO (GENERAL PLANNING) (OP-90)		
RADM F G Bennett	4D666	54380
DIRECTOR OF NAVAL WARFARE ANALYSES (OP-91)		
RADM J M Lee	4A686	50356
DIRECTOR, LONG RANGE OBJECTIVES GROUP (OP-93)		
RADM G N Miller	4A720	52758
DIRECTOR, SYSTEMS ANALYSIS GROUP (OP-96)		
RADM E R Zumwalt Jr	5E612	70831

DIRECTOR, ASW PROGRAMS

(OP-95)

VADM C B MARTELL	5D569	73408
RADM J B Tibbets (Dep Dir)	5D569	74587

ACNO (INTELLIGENCE) (OP-92)

RADM E B FLUCKEY	5C572	53239

ACNO (COMMUNICATIONS) (OP-94)

RADM R H WEEKS	4C677	57284

NAVAL INSPECTOR GENERAL

(OP-008)

VADM R C NEEDHAM	Arlx 2423	43123

DIRECTOR SPECIAL STUDIES AND PRESENTATION GROUP (OP-09D)

CAPT W G BOYER	5E732	78561

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MARCH 1967

SPEAKERS CALENDAR

DEPARTMENT OF THE ARMY

Lt. Gen. William F. Cassidy, Chief of Engineers, at Annual Meeting of Philadelphia Post, Society of American Military Engineers, Philadelphia, Pa., Jan. 25.

Brig. Gen. Harry G. Woodbury, Dep. Dir., Civil Works, Office of the Chief of Engineers, at Nebraska Watershed Workshop, University of Nebraska, Lincoln, Neb., Jan. 25.

Gen. Harold K. Johnson, Chief of Staff, at University of Arkansas ROTC Commissioning Exercise, Fayetteville, Ark., Jan. 29.

DEPARTMENT OF THE NAVY

Capt. L. B. Melson, Asst. Chief for Research, Office of Naval Research, at Naval Academy Assn. Meeting, New York, N.Y., Feb. 21.

Adm. David L. McDonald, Chief of Naval Operations, at Naval Academy Assn. Meeting, New York, N.Y., March 17.

DEPARTMENT OF THE AIR FORCE

Brig. Gen. J. S. Bleymaier, Commander, Air Force Western Test Range, at University of Southern California, Los Angeles, Calif., Jan. 27; at R. M. Greene & Associates, Los Angeles, Calif., Feb. 5; at American Society for Quality Control Meeting, Vandenberg AFB, Calif., April 27.

Gen. J. P. McConnell, Chief of Staff, at 25th Anniversary of Griffiss AFB, N.Y., Feb. 1; at Air Force Ball, New York, N.Y., Feb. 21; at Air Force Assn. Meeting, San Francisco, Calif., March 15–17; at 25th Anniversary of Tinker AFB, Okla., April 28.

Brig. Gen. P. R. Stoney, Vice Commander, Air Force Communications Service, at Armed Forces Communications and Electronic Assn. Meeting, Feb. 3; at Collins Radio Technical Assn. Meeting, Cedar Rapids, Iowa, April 11; at Armed Forces Communications and Electronic Assn. Meeting, Maxwell AFB, Ala., April 18.

Hon. Harold Brown, Secretary of the Air Force, at Air Force Ball, New York, NY., Feb. 21; Air Force Assn. Meeting, San Francisco, Calif., March 15-17.

Lt. Gen. R. L. Bohannon, Surgeon General of the Air Force, at Air Force Ball, New York, N.Y., Feb. 21.

Maj. Gen. R. W. Manss, Judge Advocate General, at Student Bar Assn. Meeting, St. Louis, Mo., Feb. 23.

Gen. B. K. Holloway, Vice Chief of Staff, at Society of USAF Flight Surgeons Meeting, Washington, D.C., April 13.

Lt. Gen. T. P. Gerrity, Dep. Chief of Staff, Systems & Logistics, at National Society of American Value Engineers Meeting, Chicago, Ill., April 25.

Contracts Awarded by Air Force for VTOL Flight Control System

The Air Force has awarded contracts totaling more than $6 million to North American Aviation, Inc., Los Angeles, Calif., and Lockheed-Georgia Co., Marietta, Ga., as part of an overall vertical takeoff and landing (VTOL) integrated flight control program designed to advance technology in Air Force VTOL aircraft development.

The contracts were awarded by the Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio, a unit of the Air Force Systems Command's Research and Technology Division.

North American Aviation was awarded $5,671,000 in a contract calling for the development and demonstration of a VTOL integrated flight system. Work covered in the contract, to be performed over a 39-month period, includes advanced development of a total integrated flight control technology, including equipment, and the conducting of flight tests necessary to verify the technology.

A letter contract for $975,000 was awarded to Lockheed-Georgia for modifications of the XV–4A "Hummingbird" VTOL aircraft to a new type system with direct lift and diverted thrust jet engines. The aircraft will be redesignated the XV–4B.

Work on the XV–4 modification project is scheduled to begin immediately with the first flight of the aircraft set for late 1967. After a five-month test program by Lockheed and acceptance by the Air Force, the aircraft will be delivered to North American for employment in an intensive research and development program to develop and demonstrate handling qualities and control design criteria for VTOL aircraft.

The VTOL flight control program, including extensive simulation and flight tests by the Flight Dynamics Laboratory, is a link in the research and development program aimed toward eventual deployment of VTOL and V/STOL (Vertical and Short Takeoff and Landing) aircraft.

The program is under the direction of the Flight Dynamics Laboratory's V/TOL Technology Division, and is headed by Richard E. Colelough, Deputy for Development and Integration.

Air Force Increases Reserve AME Units

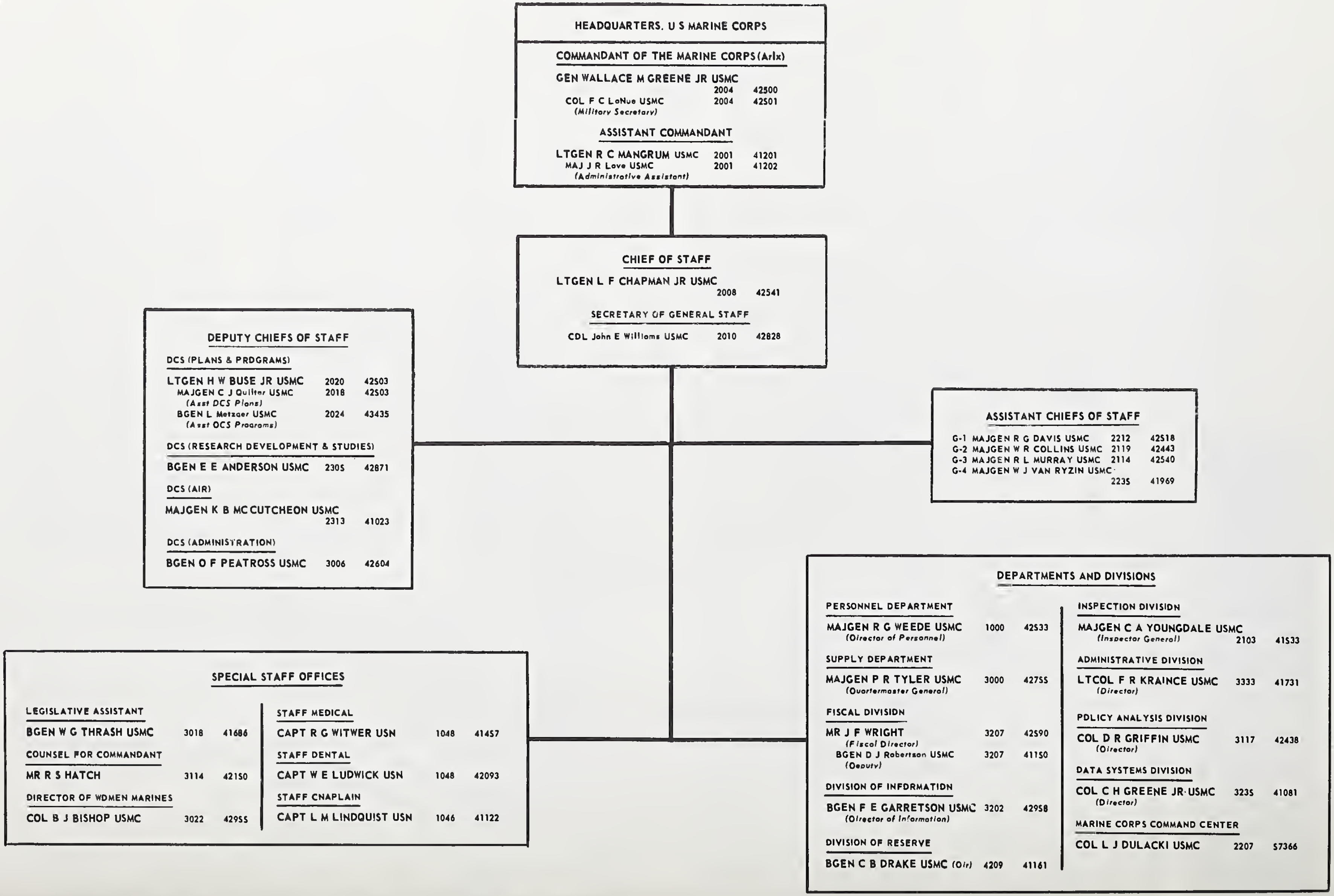
The Continental Air Command (CAC) has announced an increase of Air Force Reserve Aeromedical Evacuation (AME) units from 11 to 24 effective Jan. 1, 1967.

The increase is part of a major reorganization of the Air Force Reserve AME structure which involves the activation of 15 flights and the inactivation of three groups and two squadrons; nine other existing units will be reorganized. All 24 AME units will be assigned to Air Force Reserve Military Airlift Groups, and most will be collocated with their parent group.

Reorganization will provide the Military Airlift Command (MAC) with an expanded capability to perform its world-wide aeromedical evacuation of the ill and wounded through selective callup of trained Air Force Reserve AME units.

In peacetime, Air Force Reserve AME units will train on regular MAC routes. The forthcoming increase in Air Force Reserve AME locations will expand CAC's capability to provide the Reserve portion of the total MAC requirement in the event of a prolonged national emergency.

ORGANIZATION CHART
HEADQUARTERS, U.S. MARINE CORPS



HEADQUARTERS, U S MARINE CORPS

COMMANDANT OF THE MARINE CORPS (Arlx)

GEN WALLACE M GREENE JR USMC	2004	42500
COL F C LaNue USMC (Military Secretary)	2004	42501

ASSISTANT COMMANDANT

LTGEN R C MANGRUM USMC	2001	41201
MAJ J R Love USMC (Administrative Assistant)	2001	41202

CHIEF OF STAFF

LTGEN L F CHAPMAN JR USMC	2008	42541

SECRETARY OF GENERAL STAFF

COL John E Williams USMC	2010	42828

DEPUTY CHIEFS OF STAFF

DCS (PLANS & PROGRAMS)		
LTGEN H W BUSE JR USMC	2020	42503
MAJGEN C J Quilter USMC (Asst DCS Plans)	2018	42503
BGEN L Metzger USMC (Asst DCS Programs)	2024	43435
DCS (RESEARCH DEVELOPMENT & STUDIES)		
BGEN E E ANDERSON USMC	2305	42871
DCS (AIR)		
MAJGEN K B MC CUTCHEON USMC	2313	41023
DCS (ADMINISTRATION)		
BGEN O F PEATROSS USMC	3006	42604

ASSISTANT CHIEFS OF STAFF

G-1	MAJGEN R G DAVIS USMC	2212	42518
G-2	MAJGEN W R COLLINS USMC	2119	42443
G-3	MAJGEN R L MURRAY USMC	2114	42540
G-4	MAJGEN W J VAN RYZIN USMC	2235	41969

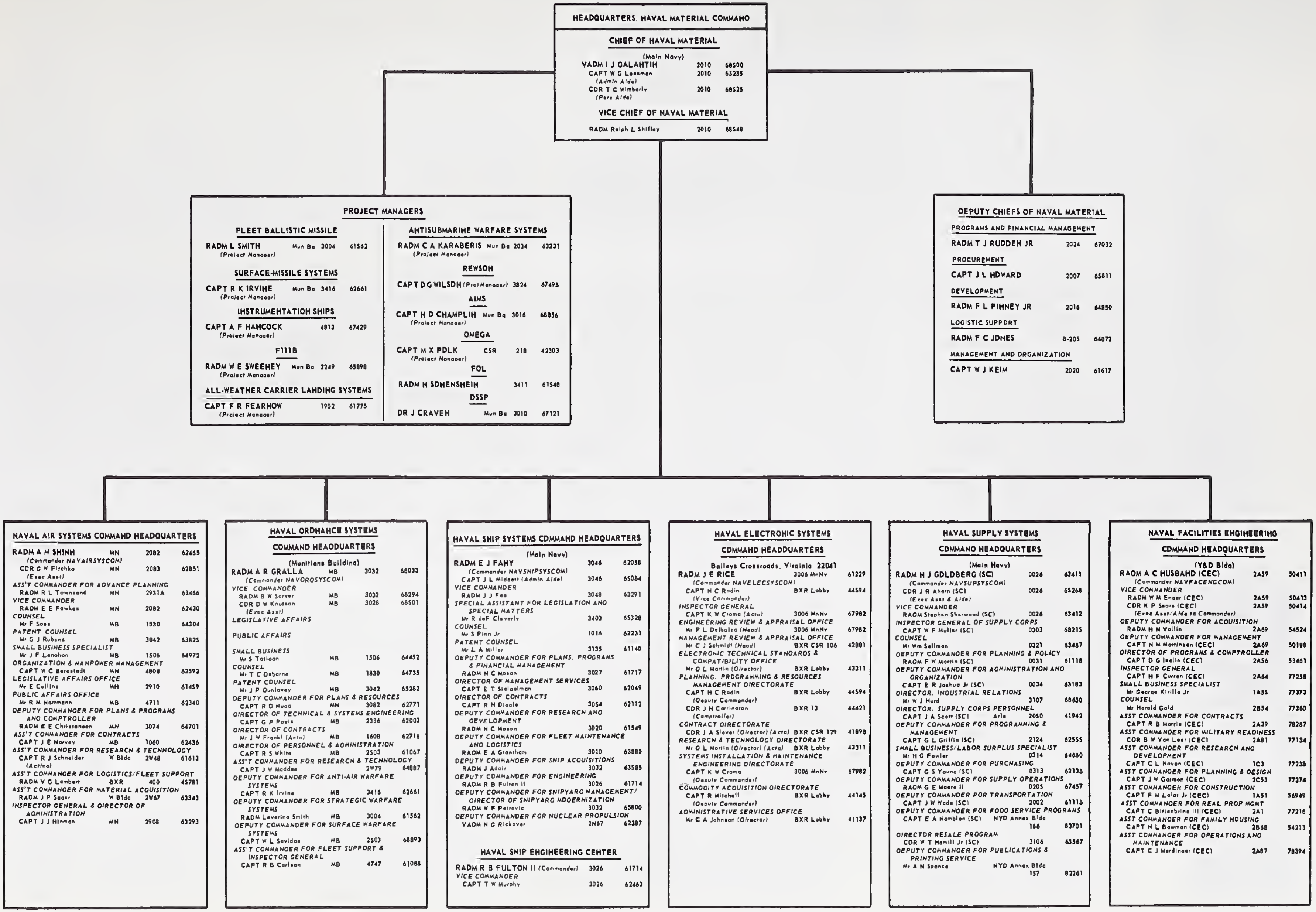
SPECIAL STAFF OFFICES

LEGISLATIVE ASSISTANT		
BGEN W G THRASH USMC	3018	41686
COUNSEL FOR COMMANDANT		
MR R S HATCH	3114	42150
DIRECTOR OF WOMEN MARINES		
COL B J BISHOP USMC	3022	42955
STAFF MEDICAL		
CAPT R G WITWER USN	1048	41457
STAFF DENTAL		
CAPT W E LUDWICK USN	1048	42093
STAFF CHAPLAIN		
CAPT L M LINDQUIST USN	1046	41122

DEPARTMENTS AND DIVISIONS

PERSONNEL DEPARTMENT		
MAJGEN R G WEEDE USMC (Director of Personnel)	1000	42533
SUPPLY DEPARTMENT		
MAJGEN P R TYLER USMC (Quartermaster General)	3000	42755
FISCAL DIVISION		
MR J F WRIGHT (Fiscal Director)	3207	42590
BGEN D J Robertson USMC (Deputy)	3207	41150
DIVISION OF INFORMATION		
BGEN F E GARRETSON USMC (Director of Information)	3202	42958
DIVISION OF RESERVE		
BGEN C B DRAKE USMC (Dir)	4209	41161
INSPECTION DIVISION		
MAJGEN C A YOUNGDALE USMC (Inspector General)	2103	41533
ADMINISTRATIVE DIVISION		
LTCOL F R KRAINCE USMC (Director)	3333	41731
POLICY ANALYSIS DIVISION		
COL D R GRIFFIN USMC (Director)	3117	42438
DATA SYSTEMS DIVISION		
COL C H GREENE JR USMC (Director)	3235	41081
MARINE CORPS COMMAND CENTER		
COL L J DULACKI USMC	2207	57366

ORGANIZATION CHART
HEADQUARTERS, NAVAL MATERIAL COMMAND MATERIEL COMMAND



HEADQUARTERS, NAVAL MATERIAL COMMAND

CHIEF OF NAVAL MATERIAL

(Main Navy)

VADM I J GALANTIN	2010	68500
CAPT W G Leesman (Admin Aide)	2010	65235
CDR T C Wimberly (Pers Aide)	2010	68525

VICE CHIEF OF NAVAL MATERIAL

RADM Ralph L Shifley	2010	68548

PROJECT MANAGERS

FLEET BALLISTIC MISSILE

RADM L SMITH (Project Manager)	Mun Bg	3004	61562

SURFACE-MISSILE SYSTEMS

CAPT R K IRVINE (Project Manager)	Mun Bg	3416	62661

INSTRUMENTATION SHIPS

CAPT A F HANCOCK (Project Manager)		4813	67429

F111B

RADM W E SWEENEY (Project Manager)	Mun Bg	2249	65898

ALL-WEATHER CARRIER LANDING SYSTEMS

CAPT F R FEARNOW (Project Manager)		1902	61775

ANTISUBMARINE WARFARE SYSTEMS

RADM C A KARABERIS (Project Manager)	Mun Bg	2034	63231

REWSON

CAPT D G WILSON (Proj Manager)		3824	67498

AIMS

CAPT H D CHAMPLIN (Project Manager)	Mun Bg	3016	68856

OMEGA

CAPT M X POLK (Project Manager)	CSR	218	42303

FOL

RADM H SONENSHEIN		3411	61548

DSSP

DR J CRAVEN	Mun Bg	3010	67121

DEPUTY CHIEFS OF NAVAL MATERIAL

PROGRAMS AND FINANCIAL MANAGEMENT

RADM T J RUDDEN JR	2024	67032

PROCUREMENT

CAPT J L HOWARD	2007	65811

DEVELOPMENT

RADM F L PINNEY JR	2016	64850

LOGISTIC SUPPORT

RADM F C JONES	B-205	64072

MANAGEMENT AND ORGANIZATION

CAPT W J KEIM	2020	61617

NAVAL AIR SYSTEMS COMMAND HEADQUARTERS

RADM A M SHINN (Commander NAVAIRSYSCOM)	MN	2082	62465
CDR G W Fitchko (Exec Asst)	MN	2083	62851
ASS'T COMMANDER FOR ADVANCE PLANNING			
RADM R L Townsend	MN	2931A	63466
VICE COMMANDER			
RADM E E Fawkes	MN	2082	62430
COUNSEL			
Mr F Soss	MB	1830	64304
PATENT COUNSEL			
Mr G J Rubens	MB	3042	63825
SMALL BUSINESS SPECIALIST			
Mr J F Lenahan	MB	1506	64972
ORGANIZATION & MANPOWER MANAGEMENT			
CAPT W C Berastedt	MN	4808	62593
LEGISLATIVE AFFAIRS OFFICE			
Mr E Collins	MN	2910	61459
PUBLIC AFFAIRS OFFICE			
Mr R M Hartmann	MB	4711	62340
DEPUTY COMMANDER FOR PLANS & PROGRAMS AND COMPTROLLER			
RADM E E Christensen	MN	3074	64701
ASS'T COMMANDER FOR CONTRACTS			
CAPT J E Norvey	MB	1060	62436
ASS'T COMMANDER FOR RESEARCH & TECHNOLOGY			
CAPT R J Schneider (Acting)	W Bldg	2W48	61613
ASS'T COMMANDER FOR LOGISTICS/FLEET SUPPORT			
RADM V G Lambert	BXR	400	45781
ASS'T COMMANDER FOR MATERIAL ACQUISITION			
RADM J P Saser	W Bldg	2W67	63343
INSPECTOR GENERAL & DIRECTOR OF ADMINISTRATION			
CAPT J J Hinman	MN	2908	63293

NAVAL ORDNANCE SYSTEMS COMMAND HEADQUARTERS

(Munitions Building)

RADM A R GRALLA (Commander NAVORDSYSCOM)	MB	3032	68033
VICE COMMANDER			
RADM B W Sarver	MB	3032	68294
CDR D W Knutson (Exec Asst)	MB	3028	68501
LEGISLATIVE AFFAIRS			
PUBLIC AFFAIRS			
SMALL BUSINESS			
Mr S Totloan	MB	1506	64452
COUNSEL			
Mr T C Osborne	MB	1830	64735
PATENT COUNSEL			
Mr J P Dunlavey	MB	3042	65282
DEPUTY COMMANDER FOR PLANS & RESOURCES			
CAPT R D Muaa	MN	3082	62771
DIRECTOR OF TECHNICAL & SYSTEMS ENGINEERING			
CAPT G P Povis	MB	2336	62003
DIRECTOR OF CONTRACTS			
Mr J W Frankl (Actg)	MB	1608	62718
DIRECTOR OF PERSONNEL & ADMINISTRATION			
CAPT R S White	MB	2503	61067
ASS'T COMMANDER FOR RESEARCH & TECHNOLOGY			
CAPT J W Maddee		2W79	64887
DEPUTY COMMANDER FOR ANTI-AIR WARFARE SYSTEMS			
CAPT R K Irvine	MB	3416	62661
DEPUTY COMMANDER FOR STRATEGIC WARFARE SYSTEMS			
RADM Levering Smith	MB	3004	61562
DEPUTY COMMANDER FOR SURFACE WARFARE SYSTEMS			
CAPT W L Savidge	MB	2503	68893
ASS'T COMMANDER FOR FLEET SUPPORT & INSPECTOR GENERAL			
CAPT R B Carlson	MB	4747	61088

NAVAL SHIP SYSTEMS COMMAND HEADQUARTERS

(Main Navy)

RADM E J FAHY (Commander NAVSHIPSYSCOM)	3046	62058
CAPT J L Midgett (Admin Aide)	3046	65084
VICE COMMANDER		
RADM J J Fee	3048	63291
SPECIAL ASSISTANT FOR LEGISLATION AND SPECIAL MATTERS		
Mr R deF Cleverly	3403	65328
COUNSEL		
Mr S Pinn Jr	101A	62231
PATENT COUNSEL		
Mr L A Miller	3135	61140
DEPUTY COMMANDER FOR PLANS, PROGRAMS & FINANCIAL MANAGEMENT		
RADM N C Mason	3027	61717
DIRECTOR OF MANAGEMENT SERVICES		
CAPT E T Steigelman	3060	62049
DIRECTOR OF CONTRACTS		
CAPT R H Diggle	3054	62112
DEPUTY COMMANDER FOR RESEARCH AND DEVELOPMENT		
RADM N C Mason	3020	61549
DEPUTY COMMANDER FOR FLEET MAINTENANCE AND LOGISTICS		
RADM E A Grantham	3010	63885
DEPUTY COMMANDER FOR SHIP ACQUISITIONS		
RADM J Adair	3032	63585
DEPUTY COMMANDER FOR ENGINEERING		
RADM R B Fulton II	3026	61714
DEPUTY COMMANDER FOR SHIPYARD MANAGEMENT/ DIRECTOR OF SHIPYARD MODERNIZATION		
RADM W F Petrovic	3032	65800
DEPUTY COMMANDER FOR NUCLEAR PROPULSION		
VADM H G Rickover	2N67	62387

NAVAL SHIP ENGINEERING CENTER

RADM R B FULTON II (Commander)	3026	61714
VICE COMMANDER		
CAPT T W Murphy	3026	62463

NAVAL ELECTRONIC SYSTEMS COMMAND HEADQUARTERS

Baileys Crossroads, Virginia 22041

RADM J E RICE (Commander NAVELECSYSCOM)	3006 MnNv	61229
CAPT H C Rodin (Vice Commander)	BXR Lobby	44594
INSPECTOR GENERAL		
CAPT K W Croma (Actg)	3006 MnNv	67982
ENGINEERING REVIEW & APPRAISAL OFFICE		
Mr P L Delbalzo (Head)	3006 MnNv	67982
MANAGEMENT REVIEW & APPRAISAL OFFICE		
Mr C J Schmidt (Head)	BXR CSR 106	42881
ELECTRONIC TECHNICAL STANDARDS & COMPATIBILITY OFFICE		
Mr O L Martin (Director)	BXR Lobby	43311
PLANNING, PROGRAMMING & RESOURCES MANAGEMENT DIRECTORATE		
CAPT H C Rodin (Deputy Commander)	BXR Lobby	44594
CDR J H Carrington (Comptroller)	BXR 13	44421
CONTRACT DIRECTORATE		
CDR J A Slover (Director) (Actg)	BXR CSR 129	41898
RESEARCH & TECHNOLOGY DIRECTORATE		
Mr O L Martin (Director) (Actg)	BXR Lobby	43311
SYSTEMS INSTALLATION & MAINTENANCE ENGINEERING DIRECTORATE		
CAPT K W Croma (Deputy Commander)	3006 MnNv	67982
COMMODITY ACQUISITION DIRECTORATE		
CAPT R Mitchell (Deputy Commander)	BXR Lobby	44145
ADMINISTRATIVE SERVICES OFFICE		
Mr C A Johnson (Director)	BXR Lobby	41137

NAVAL SUPPLY SYSTEMS COMMAND HEADQUARTERS

(Main Navy)

RADM H J GOLDBERG (SC) (Commander NAVSUPSYSCOM)		0026	63411
CDR J R Ahern (SC) (Exec Asst & Aide)		0026	65268
VICE COMMANDER			
RADM Stephen Sherwood (SC)		0026	63412
INSPECTOR GENERAL OF SUPPLY CORPS			
CAPT W F Muller (SC)		0303	68215
COUNSEL			
Mr Wm Sellman		0321	63487
DEPUTY COMMANDER FOR PLANNING & POLICY			
RADM F W Martin (SC)		0031	61118
DEPUTY COMMANDER FOR ADMINISTRATION AND ORGANIZATION			
CAPT E R Joshua Jr (SC)		0034	63183
DIRECTOR, INDUSTRIAL RELATIONS			
Mr W J Hurd		3107	68630
DIRECTOR, SUPPLY CORPS PERSONNEL			
CAPT J A Scott (SC)	Arlg	2050	41942
DEPUTY COMMANDER FOR PROGRAMMING & MANAGEMENT			
CAPT G L Griffin (SC)		2124	62555
SMALL BUSINESS/LABOR SURPLUS SPECIALIST			
Mr H G Fowler		0314	64680
DEPUTY COMMANDER FOR PURCHASING			
CAPT G S Young (SC)		0313	62138
DEPUTY COMMANDER FOR SUPPLY OPERATIONS			
RADM G E Moore II		0205	67457
DEPUTY COMMANDER FOR TRANSPORTATION			
CAPT J W Wade (SC)		2002	61118
DEPUTY COMMANDER FOR FOOD SERVICE PROGRAMS			
CAPT E A Hamblen (SC)	NYD Annex Bldg	166	83701
DIRECTOR RESALE PROGRAM			
CDR W T Hamill Jr (SC)		3106	63567
DEPUTY COMMANDER FOR PUBLICATIONS & PRINTING SERVICE			
Mr A N Spence	NYD Annex Bldg	157	82261

NAVAL FACILITIES ENGINEERING COMMAND HEADQUARTERS

(Y&D Bldg)

RADM A C HUSBAND (CEC) (Commander NAVFACENGCOM)	2A59	50411
VICE COMMANDER		
RADM W M Enger (CEC)	2A59	50413
CDR K P Sears (CEC) (Exec Asst/Aide to Commander)	2A59	50414
DEPUTY COMMANDER FOR ACQUISITION		
RADM H N Wallin	2A69	54524
DEPUTY COMMANDER FOR MANAGEMENT		
CAPT N M Martinsen (CEC)	2A69	50198
DIRECTOR OF PROGRAMS & COMPTROLLER		
CAPT D G Iselin (CEC)	2A56	53461
INSPECTOR GENERAL		
CAPT H F Curren (CEC)	2A64	77258
SMALL BUSINESS SPECIALIST		
Mr George Kirilla Jr	1A55	77373
COUNSEL		
Mr Harold Gold	2B54	77360
ASST COMMANDER FOR CONTRACTS		
CAPT R B Morris (CEC)	2A39	78287
ASST COMMANDER FOR MILITARY READINESS		
CDR B W Van Leer (CEC)	2A81	77134
ASST COMMANDER FOR RESEARCH AND DEVELOPMENT		
CAPT C L Haven (CEC)	1C3	77238
ASST COMMANDER FOR PLANNING & DESIGN		
CAPT J W Garman (CEC)	2C53	77274
ASST COMMANDER FOR CONSTRUCTION		
CAPT F M Lalor Jr (CEC)	1A51	56949
ASST COMMANDER FOR REAL PROP MGMT		
CAPT C Bittenbring III (CEC)	2A1	77218
ASST COMMANDER FOR FAMILY HOUSING		
CAPT N L Bowman (CEC)	2B68	54213
ASST COMMANDER FOR OPERATIONS AND MAINTENANCE		
CAPT C J Merdinger (CEC)	2A87	78394

MEETINGS AND SYMPOSIA

MARCH

Symposium on **Modern Optics**, 17th in a series of international symposia organized by the Microwave Research Institute, March 22-24, at the Waldorf Astoria Hotel, New York, N. Y. Sponsors: Air Force Office of Scientific Research, Office of Naval Research and Army Research Office, Contact: Lt. Col. Robert B. Kalisch (SREE), Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, (Area Code 202) OXford 4-5518.

APRIL

Annual **Frequency Control** Symposium, April 24-26, at the Shelburne Hotel, Atlantic City, N. J. Sponsor: U. S. Army Electronics Command. Contact: M. F. Timm (AMSEL-KL-SR), Electronic Components Laboratory, U. S. Army Electronics Command, Fort Monmouth, N. J. 07703, (Area Code 201) 535-2826 or 535-1728.

Physics of **Superconducting Devices** Symposium, April 28-29, at the University of Virginia, Charlottesville, Va. Sponsor: Office of Naval Research. Contact: E. Edelsack, Office of Naval Research Branch Office, 1076 Mission St., San Francisco, Calif. 94103, (Area Code 415) 621-3828.

Annual symposium in Applied Mathematics "Conference on **Transport Theory**," dates undetermined, New York, N. Y. Co-sponsors: U. S. Army Research Office-Durham and Air Force Office of Scientific Research. Contacts: Dr. Francis G. Dressel, Mathematics Div., Army Research Office-Durham, Box CM, Duke Station, Durham, N. C. 27706, (Area Code 919) 286-2285, ext. 50; or Maj. John Jones Jr., (SRMA), Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, (Area Code 202) OXford 4-5261.

MAY

Annual National Colloquium on **Information Retrieval**, May 3-4, at the Hotel Adelphia, Philadelphia, Pa. Contact: STINFO Project Director, A 2100, Frankford Arsenal, Philadelphia, Pa. 19137, (Area Code 215) JE 5-2900, ext. 3219.

Sixth **Rare Earth** Conference, May 3-5, Gatlinburg, Tenn. Co-sponsors: Air Force Office of Scientific Research and Oak Ridge National Laboratory. Contact: Dr. Anthony J. Matuszko (SRC), Air Force Office of Scientific Research, 1400 Wilson Blvd., Arlington, Va. 22209, (Area Code 202) OXford 4-5337. Program details contact: Dr. W. C. Koehler, Solid State Div., Oak Ridge National Laboratory, P. O. Box X, Oak Ridge, Tenn. 37831.

Conference on **Expandable and Modular Structures for Aerospace Applications**, May 15-17, at the Carillon Hotel, Miami Beach, Fla. Sponsors: Air Force Aero Propulsion Laboratory, Space General Corp. and GCA Viron Div. Contact: Fred W. Forbes (APFT), Air Force Aero Propulsion Laboratory, Wright-Patterson AFB, Ohio, 45433, (Area Code 513) 253-7111, ext. 52771.

Interagency Data **Exchange** Program (IDEP) Annual Conference, May 16-18, Clear Lake, Tex. Sponsor: Policy Board, IDEP. Contact: Army Representative, Policy Board, IDEP, Systems Research & Development Branch, S&TI Division, Army Research Office, Office of Chief of Research & Development, Washington, D. C. 20310, (Area Code 202) OXford 4-3513.

Navy Conducts Simulated Deep Ocean Dives in Preparation for SEALAB III

The U.S. Navy Experimental Diving Unit (EDU) in Washington, D.C., has begun a series of simulated deep ocean dives and physiological experiments under high pressure in preparation for next year's Man-in-the-Sea experiment, SEALAB III.

SEALAB III, one of a continuing series of Navy ocean experiments, will provide additional technology necessary to establish man in advanced sea habitations on the continental shelves for extended periods. This will enable Navy divers to perform a variety of useful work on the ocean bottom.

The simulated dives and experiments, conducted jointly by the staff of EDU and the Deep Submergence Systems Project Technical Office, will provide the basis of the nearly nine months of preparatory training required of Navy aquanauts scheduled to participate in SEALAB III. At the EDU pressure chamber complex, the divers will experience pressure conditions similar to those which will be encountered in the ocean.

Each of the two newly modified pressure chambers at EDU consists of a wet diving tank 10 feet high and about nine feet in diameter. The tank (sealed at both ends) is connected by a hatch to an igloo-like structure. The igloo itself is connected by means of a tunnel to a recompression chamber, igloo area, and wet diving tank. These can be subjected to pressures equal to that encountered 1,000 feet below the ocean surface.

For the simulation of a deep dive, divers enter the water in the wet tank and the door to the igloo entrance from outside is closed with the hatch between the igloo and wet tank left open. The wet tank and igloo are both pressurized to the depth required to the dive. While the dive is in progress, the inner lock of the recompression chamber and the tunnel to the igloo are taken to the depth of the dive. When the bottom time is completed, the pressure in the entire complex is reduced to the first decompression stop. The divers then enter the igloo from the wet tank by ladder and transfer to the inner lock of the recompression chamber. The dive profile simulates a submersible decompression chamber with transfer to a topside chamber.

In the event of an emergency requiring help in the wet tank, personnel could enter the outer lock and be pressurized to the depth of the inner lock. The connecting hatches are opened to provide free access to the wet tank.

Training activities in the modes described include short duration single dives to the 450-foot level. A later phase of training will include saturation dives of three to four days in duration. In this case, the divers will be pressurized in the inner lock to depths of 450 feet, subsequently making excursion dives to igloo and wet tank at pressures encountered at 600 feet. The excursion to deeper depths will not require decompression, and divers when in the wet tank will spend about an hour working and swimming in a cycle consistent with projected underwater experiments.

The EDU staff of 42, includes four civilian engineers, three medical doctors specialized in diving physiology, and 22 enlisted experimental divers. All 22 divers are volunteers as human subjects.

Training of 12 SEALAB III surface support divers and technicians began Sept. 12, 1966. Training of aquanauts for SEALAB III is not scheduled as yet pending the complete selection of personnel.

FROM THE SPEAKERS ROSTRUM

Address by Maj. Gen. Walter E. Lotz Jr., Chief of Communications-Electronics, Office of the Chief of Staff, U. S. Army, to the Washington Chapter, Armed Forces Communications and Electronics Assn., Washington, D.C., Dec. 1, 1966.

Maj. Gen. Walter E. Lotz Jr., USA

COMMUNICATIONS IN A COUNTERINSURGENCY ENVIRONMENT

I have been on the job here for 90 days and I can state that the Army's communications-electronics challenge and potential from a soldier's, engineer's, scientist's, or industrialist's viewpoint have never been greater.

The tremendous awareness and interest of the role and significance of communications-electronics on the part of the Chief of Staff and the Secretary of the Army, and their personal support, make it eminently clear that I have a real job ahead of me to live up to their demands and expectations. In this regard, both the Army and myself will need your continuing help and support.

It is inevitable that people returning from Vietnam appear to be preoccupied with, if not just plain insistent on, talking about the situation there and how it affected their jobs. Brace yourselves because I am no exception. I will describe the communications situation in Vietnam both from the context of the unique characteristics of operations and communications, and from what we might do to better prepare for counterinsurgency in other underdeveloped countries.

It is painful to admit, but let us face it, too often our communications concepts, doctrine, and even systems, have a way of reflecting the situation which occurred in the last previous major conflict or war. When you couple this normal bias with the long lead-time for development of requirements, the conduct of research and development, and the acquisition and installation of communications-electronics hardware in the field, it is apparent why we have so much "undoing" to go through as well as "doing."

Some of our most cherished ideas and concepts of communications-electronics were jolted in Vietnam.

One of these was our well established concept of differentiating between strategic and tactical communications; another was the viewpoint that each of our Military Services had to own or have organic to their command the communications which served their command and control, operational, and supporting activities. Finally, the view that the military communicator would fulfill only the military needs, and somebody else would look after the communications needs of the civilian government, commercial and industrial organizations, the population, and the press was destroyed. I might add here, as a sidelight, that experience in South America jibes with these lessons learned in Vietnam.

War in Vietnam is being fought, as most counterinsurgency actions are today, in a truly underdeveloped country. From the communicators' viewpoint, there are no developed telecommunications or telephone systems of the type to which we are accustomed serving governmental and commercial needs. Little use is made of cable and wire, outside of the populated and protected areas, because wire lines and cables can be—and have been—cut by the guerrilla forces. In the war in Europe, and even in Korea, our military forces were able to reconstruct and utilize buried cables along with other remnants of the communications infrastructure. This is not possible in Vietnam. In Vietnam, the U. S. military has had to build a main-line telephone and telegraph trunking system with local distribution, virtually from scratch.

In the conventional concept of military communications, we visualize a front of operations with communication circuits radiating from headquarters, bases and depots in secure rear areas to combat units on the front lines.

In this concept, headquarters displace to maintain control of the combat elements as the tide of war progresses. In ground combat operations in the Republic of Vietnam there is no classical front or rear, nor any totally secure area. Combat is conducted from time to time in all parts of the country. There are no sanctuaries free from the activities of the Viet Cong and no communication installation is free from the threat of attack. Nor in this war do we see the displacement of major headquarters. Large headquarters, airfields, supply depots and base camps of major units remain in fixed localities. Thus the long-haul communications system linking the major terminal points is geographically fixed; it remains static and need not have the capability of moving periodically. From time to time, brigades, battalions and smaller units move out from their base camps to conduct search-and-destroy missions. To accommodate this, the fixed communications system is extended by mobile tactical equipment, which provide what are called "tactical tails," connecting the combat units to the fixed communication system.

The fixed long-haul communications network in Southeast Asia including Thailand, designated the Integrated Wideband Communications System

(IWCS), is a distinct departure from conventional communications systems. Let us examine why.

First, while the U. S. ground combat troop complement in Vietnam corresponds generally to a field army, this army is dispersed over a territory 700 miles long and varying in width from 40 to 100 miles. Conventional military planning provides a field army communications system that covers an area about 200 by 180 miles.

Second, in conventional military planning, we visualize a strategic communications system which extends our world-wide communications into combat theaters as far forward as the headquarters of field armies. In Vietnam, the IWCS, which is integrated with the world-wide system, extends to divisions, brigades and even smaller units. Therefore, it is both strategic and tactical. The significance of this point is more than just conceptual. Our strategic communications equipments are engineered to fixed plant commercial standards, while our tactical systems have been designed around engineering parameters which are most convenient for employing highly mobile equipments providing relatively few circuits per path.

In the conventional system we can interface the strategic and tactical systems at a single entry point at the headquarters of a field army and can, therefore, tolerate the introduction of interface equipment so that the strategic system will play successfully with the tactical system.

In Vietnam, we can identify some 75 interface points between the IWCS and tactical systems. At each of these points, we must have equipment to test and interconnect circuits and channels which have several multiplexing systems, modes of teleprinter operation, and transmission levels.

The IWCS is the primary, point-to-point, communications system meeting the requirements of all Military Services except, of course, for the organic tactical communications of divisions when they are deployed from their base camps.

Furthermore, the IWCS must provide communications for the American Embassy, the U. S. Agency for International Development, and the U. S. Information Agency in prosecuting their important programs for assisting the Vietnamese government in economic and social improvement.

In addition, the government of South Vietnam must look largely to the U. S. forces for dedicated circuits for air traffic control, public safety, radio broadcasting, railroad operations and many similar activities—and for common-user, long-lines telephone service. You can see, then, that the IWCS is a combination of a military command control system and an AT&T long-lines system for South Vietnam. In view of this, I am sure that you can imagine the wide variety of terminal equipments which are interconnected by this system.

This military-established, long-lines system is significant in size and is still growing. The backbone, or primary trunking links, handle as many as 240 voice channels. The total number of terminal-to-terminal circuits in the IWCS will eventually exceed 5,000.

The establishment of such a system requires more than engineering, procurement and installation. Almost all the circuit paths traverse enemy-controlled territory. Relay sites and interconnect points located outside of secure base areas must first be organized and equipped for defense against attack and sabotage. This has dictated that high-capacity, troposcatter systems must be the primary equipment in the backbone network. As a consequence, we have quickly—and with great effort and expense—put into being a highly sophisticated system of troposcatter and microwave equipment that is demanding upon our resources of skilled operator and maintenance personnel.

This cost is necessary if we are to provide the communication support needed by us, the Vietnamese and other Free World forces in prosecuting the war.

Although Vietnam today is demanding most of our attention and resources, we must remember it is only part of the struggle being conducted by the United States and the free nations against the world communist movement. Social unrest and insurgency exist in many underdeveloped and emerging nations of the world. Low level insurgency, that is, insurgency not involving large scale military engagements, occurred in Vietnam during the 1954 to 1963 time frame. It exists in other countries today, and could further materialize at various levels of intensity in still other countries.

The fundamental aim of the insurgents is to overthrow the existing government. Their means of doing this is to disrupt the conduct of government programs, such as education, law and order, industry, commerce, and economic and social development. They accomplish this through propaganda, demonstrations, riots, sabotage, terrorism and outright atrocities. For example, they murder public officials and commit atrocities against their families, thus making it difficult to recruit responsible and qualified administrators. They bomb restaurants, thereby spreading the police force out to reach and protect all public places. They destroy bridges, thereby tying down the armed forces to protect all other vulnerable points on roads and railways. They levy taxes and collect them—by violence, if necessary—on farmers, merchants and fishermen to finance their operations.

The police, paramilitary and military counterinsurgency forces are continually in a defensive posture in reacting to insurgent incidents. The times and places of these incidents are at the choosing of the insurgents. The insurgents have the initiative. They usually concentrate on rural areas where law and order is the slowest and least effective, primarily because of deficiencies in transportation and communication. The counterinsurgency elements must have good intelligence, rapid warning of incidents, and the ability to mobilize and dispatch the required amount of force to the right place. This requires that the nation be literally covered with a comprehensive and reliable communications system to insure quick reaction to the insurgent forces.

It is interesting to note that insurgency is more successful in those countries which do not have a well developed communications system—either government or commercial.

To provide such a communications system in Vietnam and other similar countries, a highly organized radio system consisting of nets—by political and geographical boundaries—is extended down to each village, hamlet and military outpost. The equipment at the village or hamlet level is battery operated since electrical power is highly unreliable, if avaliable at all. The system, of course, must be capable of being operated, particularly at the lower levels, by unskilled civilians. This dictates a system that must be both simple and portable, using entirely voice operation.

In counterinsurgency operations, this village and hamlet radio network may or may not be the responsibility of military forces.

Some of you may be familiar with the networks in Vietnam. If so, you know that our U. S. Agency for International Development, and not the Defense Department, provides this system. You may also know that this network is neither operated nor maintained by the Armed Forces.

Here is an area where the potential of our great American electronic technology has not yet been brought to bear fully on the problem. More effective and more adequate radio sets can be designed and produced in large quantities to assist in the underdeveloped countries. I throw this problem to you as a specific challenge.

Next, insurgency thrives best within the rural localities where the citizen is out of contact with his government. In fact, in Vietnam—until recent years—the average rice farmer and fisherman were not too keenly aware of, or interested in, the central government. Newspapers, motion pictures and radio broadcasts were not a significant part of their lives. They were almost out of touch with the government. We, in fully developed democratic nations, know well that the responsiveness of the government to the needs of the populace depends upon active participation in the government's processes. This requires mass communications media from the government to the people. In Vietnam radio broadcasting, newspapers, leaflets and other media have been developed and are being used; however, this year a new medium was introduced with initial results that exceed all expectations.

The Defense Department, the State Department, the Agency for International Development, and the U. S. Information Agency, in a joint effort, initiated television broadcasting in the area immediately surrounding Saigon on Feb. 7, 1966. Initially, the broadcast originated from U. S. Navy Constellation aircraft equipped to transmit on two channels simultaneously from program material prepared in advance on video tape and 16mm kinescope films. Standard American commercial receivers were procured and distributed. Since then the system has been improved. About six weeks ago, on Oct. 25, a permanently installed high-power television facility commenced operation in the Saigon area. In addition, eight mobile trailer-mounted vehicles for the U. S. Armed Forces will be in operation to cover areas in the southern delta, northward along the coast, and in the central highlands. The U. S. Government will assist the government of Vietnam in building three additional stations to be located at Can Tho, Qui Nhon, and Da Nang or Hue.

The fundamental aim of this U. S.-assisted program is to "reach the Vietnamese people." Programs to bring the isolated people into the governmental family are of no use unless the program is understood. Without a means of quickly communicating with the multiplicity of hamlets and villages that exist, the government must either resort to roving teams of instructors or abandon the areas to the control of others.

The introduction of television into Vietnam was a bold step. Lessons learned there will be most valuable in approaching this again in other parts of the world.

First, what are some of the advantages of this step; secondly, what are the payoffs; and, last, what are some of the typical problems faced when introducing the latest form of mass audio-visual communications into underdeveloped areas?

The Vietnamese are people with a high sense of tradition and a diverse culture which employs the dramatic arts extensively. TV as a vehicle to provide classical Vietnamese plays, dramas and operas in their native language was a natural. The problem of illiteracy was overcome in that the people did not need to read to understand the message being put across. The times for television broadcasting were selected so that the working people would be reached in their homes during the early evening hours. Program material included news, educational programs and entertainment.

The introduction of TV was something that the entire Vietnamese family could enjoy. Their social structure, which, of course, is Oriental in nature, depends upon the close ties of the family and its maintenance of culture, pride and desire for freedom. TV can capitalize on these basic levels, motivations and social orders.

It can be tentatively concluded that TV may be introduced in an underdeveloped country with a high expectancy of success. Its value as a means of educating, informing and entertaining the people in remote areas can only be limited by your imagination. It could be a powerful tool for stabilizing governments during periods of social readjustment.

Such an experiment in Vietnam was not without problems. It is here that the greatest challenge to American ingenuity and industry is presented.

The standard commercial receivers are too complex for an uneducated individual in rural locations to operate, much less repair or maintain. The associated problem of antennas in fringe areas, the delicate tuning of channels, adjustment of the picture tube, fragility, and English-language markings all added difficulties at the outset. I am sure that there are solutions to all these problems. I visualize that a need exists for a mass-produced set, marked with the indigenous language of the people for whom it is intended, with simplified channel tuning, ruggedized, designed for battery or multiple frequency and voltage operation, and provided with more powerful audio amplifiers (say 25 watt) to accommodate outside speakers for community viewing. Another problem exists in the area of training indigenous technicians, engineering and studio personnel. The lack of a broad technological base in many countries inhibits the training of personnel to the U. S. standards of technical proficiency.

We have already witnessed the dramatic introduction of this medium of mass communication into Vietnam. We recognize its potential as an aid in countering communist-inspired insurgency operations—a capability to quickly and expertly apply production and technical know-how in serving the needs of other countries.

Here is a new dimension of communications-electronics to help win the wars of insurgency and, more important, to help sustain peaceful social, political and economic development.

The lessons we are learning in Vietnam are significant in planning our future course in communications-electronics.

We have learned that our conventional concepts of military communications systems must be extensively altered in wars of counterinsurgency.

However, the great American know-how in electronics equipment and mass production has responded magnificently to the environment in Southeast Asia. We must now capitalize on this tremendous American resource in bringing peace to the world and maintaining it.

This is an opportunity and a challenge which all of us welcome I am sure.

Address by RAdm. J. D. Arnold, USN, Dep. Chief of Naval Material (Logistic Support) at Ninth Annual Navy-Industry Conference on Material Reliability, Washington, D.C., Oct. 26, 1966.

RAdm. J. D. Arnold, USN

Systems Effectiveness and Combat Readiness

Improving the effectiveness of warfare systems is probably the most valuable single contribution any civilian can make to combat readiness of the fleet today. So individuals in industry and the Navy are all basically working toward the same goal: a more effective fleet.

After a continued attack over the last several years, the efforts of systems effectiveness engineers across the country are, cumulatively, producing the levels of systems performance the fleet requires. What I want to talk about is this: Engineering excellence is a worthwhile goal, to be sought by us all, but it is also necessary for the systems effectiveness engineer to include non-technical factors in his plans and calculations. Technical effectiveness alone is not enough.

If our fighting fleet is to have the stamina which marks the champion, considerations of logistics support and human factors engineering must be far more closely combined with engineering considerations than has usually been the case in the past.

One of Mahan's axioms is that effectiveness in battle depends in large part on proper logistics support. Every sailor knows instinctively that you can fight only as long as the essential material is on hand. "Essential material" means mainly "Bullets, Beans, and Black Oil." It also means "gear that works."

Before the war I served as senior flight test pilot in Hawaii. One old chief petty officer who worked with me said something I will always remember. He pretty well combined Mahan's thought with the basic concepts of systems effectiveness. He was talking about the R–1820 engine, which was one of the most powerful aircraft engines the Navy had in those days. "I like those engines," he said. "They don't break, and when they do they are easy to fix."

I'm afraid that if the Chief were still with us he would have a few other things to say. When I left the Pacific Fleet in September, I carried away the conviction that too many of our basic tools of sea power do break, and break too often, and when they break they are too hard to fix. In today's language they lack reliability and maintainability.

Let's deal in specifics: survival radios, for example.

These are the miniature radios pilots use to call for help in survival situations. They are the most important pieces of equipment carried by our pilots. Sometimes they are the last hope of a man who may die or be captured if his radio doesn't work.

I happened to be inspecting the supply section at North Island when a shipment of these little radios arrived. Because I know that there is no such thing as too many inspections on these items, I called for a carton of them to be opened and the radios tested.

We rounded up a battery and went across the street to a test shop. The second and fourth radios, out of the six in the box, didn't work. Later we found that a plastic wafer had been left out of the on-off switch.

Another example: cable for helicopter sonars. The Navy has been operating anti-submarine helicopters for more than a decade. You would think that by now we would have waterproof, flexible cable for lowering the sonar from the helicopter into the water. Well, the cable is flexible.

Name a radio or an avionics package, and I'll name a system that doesn't perform as it should.

Small systems aren't the only troublesome ones. I am about to name a few airplanes, but I want it to be understood that I am not criticizing the airplane manufacturer, or at least not him alone. Our problems, generally, are in the black boxes which ride inside the airplanes. The engines in the airplanes, the mechanical and hydraulic systems, the planes themselves are superb products of the American aircraft industry. It's the gadgets inside—radars and other electronic systems that cause the trouble.

Most of you know that the E–2A early warning aircraft, the A–6 attack plane and the RA–5C reconnaissance aircraft had severe reliability problems when they first entered service. The mean time between failure of their primary sensors, data links, computers and radars was measured in minutes. These planes were bought by the Navy to be the finest and most advanced machines of their types in the world. And they are, but only part of the time.

I'm glad to say that their performance in the fleet has improved and is much better than it was only a few months ago. After 470 major engineering changes on the A–6 and 1,400 minor ones, with all that these changes imply about configuration control and spares support, the fleet units had a pessimistic outlook when they first received the planes. Now, in general, performance in service exceeds expectations and these planes are, in fact, superior weapons.

But each of these planes, and every other first line aircraft that I can think of, achieves the necessary performance at the price of an excessive upkeep effort. At one time, more than two dozen contract technicians were aboard the Kitty Hawk in the South China Sea, working with our crewmen to keep the ship's E–2's and RA–5's "up". They were reasonably successful, but we don't intend to make the fleet a test and development force. The place to create systems effectiveness is ashore.

The real point is that overall effectiveness of these planes was degraded and their battle readiness reduced because a disciplined approach to systems effectiveness was not applied to them early enough or strongly enough.

I do not want to seem excessively critical, and it is true that the Navy-industry team generally produces quality systems. But most of these systems perform well only because the most limited resource the Navy has, sailor-hours, or more precisely, perhaps, maintenance talent and time, are lavished upon them.

A number of life cycle cost studies recently showed that maintenance and operational costs throughout the life of a typical system ran from six to 70 times the original cost of the item. Two-thirds of the maintenance costs were for technical talent —brainpower. Maintainability and repairability are certainly areas of systems effectiveness which must be brought under control promptly.

As an example of what I'm driving at, two A–4's—that we know about—were lost because of faulty design for maintainability. In each case, a maintenance man had dropped a nut into the fuel cell. Why?

Installation of a fuel pump on an A–4C requires removal of the engine—a 16-manhour job. It then takes two men four hours to remove the fuel pump. The last nut is removed by use of a special tool and by feel.

In spite of warnings following loss of the first aircraft, a second was lost a month later for the same reason. Those of us who are concerned about maintenance wish some maintenance engineer had looked at this installation early in the game. The A–4 is an execeptionally well designed and reliable machine, but a revised installation method or a screen over the fuel pump inlet might have saved two—at least two—A–4's.

I wish maintenance didn't require so many special tools. A mechanic on a carrier is always working in close quarters, aircraft are packed tightly together, lighting is barely adequate, and the special equipment is usually at the other end of the hangar bay. Pressure to get the planes back into the air is always present. As a result, a certain number of nuts are going to be dropped. But no more, I hope, into fuel pumps.

All of us here today are managers of one sort or another, and it is the business of managers to deal with exceptional situations, to be concerned with problems, to correct difficulties and to set things right. If we did not believe that there is much to be set right, we wouldn't be here. And we might as well recognize, collectively, that it is upon this group, and very few others like it, that the ultimate responsibility rests for delivering to the operating forces of the Navy and the Marine Corps the effective systems they need. There is challenge a plenty for all who manage technical warfare systems.

One of the principal mechanisms which binds managers together in the business of creating weapon systems is the contract. Well-engineered systems (those which don't break and are easy to fix when they do) result, in part, from a firm meeting of the minds between the Navy and industry, between buyer and seller.

A contract is a legally enforceable agreement, and it is a good bit more. Members of the Navy-industry team have varying points of view—complementary and interdependent points of view, differing but not necessarily conflicting perspectives—on the real meaning of a contract.

Considering a contract not only as an agreement, but also as a vehicle for increasing say, systems effectiveness, let us examine three separate points of view: those of the project engineer, the contracting officer, and the businessman.

A good many of the project engineers I have known tend to think of a development or production contract as an administrative tool; a tool which helps get done what they want done. The basic concern of the engineer focuses on the technical excellence of the end product. To him costs and enforceable agreements are important, but I think that primarily most project engineers regard a contract as one more milestone on the long road linking concept formulation with successful deployment, at sea, of the final product.

I won't try to describe the viewpoint of the "typical businessman," if there is such a soul, except to say that I have heard many successful bidders talk of their contracts as being filled simultaneously with promise and with peril, with certainty and with risk, and with obligation as well as opportunity.

The contracting officers take still a different perspective. Some, the minority, feel that contracting is simply a straightforward legal function, completely separate from the technical characteristics of the items contracted for. This type of contracting officer says, "Write down your technical requirements, forward them with a procurement request, and I will prepare a legal contract." To him systems effectiveness is a legal result of including standard military specifications in the contract.

A more imaginative officer would talk a broader view. He might say to the project engineer, "I'll tell you how to get more bang for your buck, more rubble for your ruble. We will work together during the development period. We'll work up a first-rate advance procurement plan. I'll show you how you can design 'procurability' into your system."

This fellow recognized the value of planning, during the development process, for eventual procurement. He will probably attempt to plan well enough so the item can be procured through a fixed-priced contract. He may work out a multi-year buy, or some other type of imaginative approach.

Still a third contracting officer might take an even wider perspective on his ability to influence the effectiveness of the system to be contracted for. "Write your specifications in such a way that we can offer incentives: payment for better performance, higher reliability, superior maintainability," he will urge.

This individual is really talking about incentive contracting which has only begun to be exploited as a mechanism for rewarding businessmen who produce systems of superior effectiveness.

More and more in the near-term future, the most astute contracting officers will lean toward incentive contracting where this form of contract makes sense. But they can do this only as readily as the engineers help them design and pin down, with audit accuracy, the value to the Government of increased systems effectiveness.

I positively foresee that the contracting pendulum will swing toward more incentive contracts during the next few years. To an increasing degree in the future, incentive contracts will reward or penalize these who build or don't build effective systems.

There is no question in my mind that the main improvements in effectiveness in the near-term future will result from increased emphasis on incentive contracting. Every sign points that way.

In the last four years, cost-plus-incentive-fee (CPIF) contracts, as a percentage of DOD contract dollars, have doubled. This year about one procurement dollar in twelve will change hands under a CPIF contract.

During the same period of time, the value of fixed-price-incentive (FPI) contracts has increased by one-third. This year, one DOD purchase dollar in six will be awarded on a FPI Contract.

At this moment almost $800 million is being offered in incentives for superior contractor performance in the shipbuilding program. Some 46 ships are involved. One of the principal incentive features is that standardization of equipment within the ships—pumps, valves, motors and the like—is, for the first time, a goal to be sought by the contractor and rewarded by the Government. This can be done because a number of skilled people for the Naval Ship Systems Command proved positively that the Government would receive more than $800 million worth of value if the pumps and valves were similar, not different.

Multiple incentives in contracting are relatively new, but will become more and more common during the next few years. Incentives for cost, schedule and performance improvements are likely to be offered whenever the Government can measure, with reasonable accuracy, the worth of the improvement.

One of the big questions, and a hard one to answer (at least with answers that will bear up under audit) is what should the Government pay for increased performance—for increased systems effectiveness. Converting "worth to the Government" into specific, justifiable dollar values is one of the prime problems in the field of contracting today. Its solution depends largely on improved data collection and input from engineers who think in terms of overall systems effectiveness.

Examination of military worth quickly leads to examination of basic tactical and strategic assumptions, to trade-offs between the various elements of life cycle costs, and to fundamental questions of cost effectiveness.

This area is full of pitfalls. What is the true value of standardization, improved safety levels, improved crew member efficiency? How do you handle change orders without jeopardizing the contractor's opportunity for reward?

How much value do you place on meeting major milestones, and how much on meeting the final delivery schedule? All these and many other questions have to be answered, not only by the military side of the team but also by industry.

Certainly incentive contracts, and especially multiple incentive contracts, will have an increasing impact on systems effectiveness.

Defense Department Cited for Support of Sheltered Workshops

The Defense Department has been cited by Harold Russell, Chairman of the President's Committee on Employment of the Handicapped, for its support and cooperation in encouraging defense business participation in the sheltered workshops program.

The commendation was presented to Assistant Secretary of Defense (Installations and Logistics) Paul R. Ignatius during ceremonies at the Pentagon on Dec. 20.

DOD's program to help workshops includes a directory listing the productive capabilities of over 200 work shops which has been distributed to all DOD procurement officers throughout the country. Secretary Ignatius has stated that procurement officials in the Military Departments and the Defense Supply Agency should consider including workshops on bidders' lists for items they can produce. In addition, a leaflet, carrying DOD's endorsement of the workshop program and encouraging prime contractors to "give workshops every opportunity to compete for subcontracts" is attached to every prime contract awarded by the Defense Department.

Also, workshop directors are provided schedules of locally sponsored DOD procurement clinics so that they can attend those held in their vicinity.

Assistant Secretary of Defense (Installations & Logistics) Paul R. Ignatius, left, accepts a commendation from Harold Russell, Chairman of the President's Committee on Employment of the Handicapped.

(Continued from Page 4)

permitted to employ a single appropriation for each DOD component for all operating costs combining the existing appropriations for military personnel and operations and maintenance. Such an amalgamation would greatly facilitate the budgeting and accounting for operating costs. But even if two separate appropriations are maintained, DOD will still combine them for internal purposes and convert for external reporting purposes at the headquarters level. The Navy is already receiving reports which reflect full costs including costs of military personnel of all units of both the Atlantic and Pacific Fleets.

The third change is the purification of appropriations so that all expense items are associated with the operating appropriations and none with the procurement or construction appropriation. Primarily, this involves shifting many items of spare parts and similar consumables from continuing appropriations to operations. It also involves moving a few capital items from operations appropriations to continuing appropriations. Once this is fully accomplished, all expenses, and only expenses, will be included in the operating appropriation. DOD Instruction 7040.5, "Definition of Expenses and Investment Costs," dated Sept. 1, 1966, carefully spells out the criteria governing this purification. The care with which the instruction was developed is demonstrated by the fact that it consumed five months of steady effort, went through 13 separate revisions, and was analyzed in three separate DOD-wide reviews.

The final action necessary to achieve the goal of charging 100 percent of measurable expenses to operating activities is the extension of working capital to cover all items in the operating appropriation. Such an extension allows the association of costs with the using activity at time of use. Under the former system, purchases were often made and the appropriation charged by a central organization long before and far from the time and place of use. Centrally procured fuel or aviation spare parts are examples of this. Such material was then furnished "free" to the ultimate user. Since these expenses were not charged to him, the user had little motivation to give them the kind of management attention he gave to items which actually cost him money. Working capital solves this problem by permitting costs to be held in suspense from the time of purchase until the time of issue for consumption. At the time of issue for consumption, they are charged to the user.

Working capital is not a new concept. Many supply items are currently held in stock funds, and many services in industrial funds. Stock funds will be extended to include all consumable material, at both wholesale and retail levels, and industrial funds will be expanded to include those wholesale service activities not now under them. Finally, working capital accounts within the operating appropriation will be established for local services, such as maintenance and the motor pool. The realities of a combat environment will be recognized by charging for operating resources at the time of movement to the theater.

Effect on the Budget. The budget process will change radically as a consequence of Project PRIME. The FY 1968 budget will be converted to expense terms prior to July 1, 1967, when the new system becomes effective. FY 1969 will see a full-scale combined program/budget submission and review in expense terms by program elements and organization units within DOD. Congress, of course, will retain the option of receiving it on this basis.

Outlook for the Future. Project PRIME means that the manager's flexibility in deciding on what resources to use should be increased. He should be encouraged to think about, for example, the best balance between military personnel, civilian personnel and contract personnel, or the optimum degree of mechanization, in a wide variety of situations. With the financial segregations that now exist, managers have little incentive for investigating such alternatives.

It means also that there should be a tendency on the part of top management to move in the direction of control of aggregates and away from control by bits and pieces. It would be expected that, as time goes on, there will be less emphasis on individual items of expense—less detailed control of manpower and less detailed consumption rules for example—and more emphasis on expenses as a whole.

Finally, the system should motivate managers to be more concerned about the efficient use of resources. Of course, efficiency is only one criterion for judging a manager, and attention to efficiency must never be permitted to overshadow the criterion of effectiveness, which means getting the job done, and done well. But managers do need to know how efficiently their subordinates are performing their assigned missions, and the new system will help them learn this. Moreover, as performance measurement criteria change to incorporate this additional information, the motivation will be increased for managers to be concerned with the wise use of resources, thereby reducing the need for exhortation, inspection, specified constraints, and other devices that are now used as a substitute for a built-in motivation.

Conclusion.

When Project PRIME "goes live" on July 1, 1967, it will not function as a perfect and complete invention. The system faces many modifications and probably years of refinement. While the first programming system directly affected a few hundred people working in the Pentagon, Project PRIME will affect thousands throughout the entire Defense establishment. The extent of the job to be done in education alone is staggering.

Nevertheless, Project PRIME will achieve one fundamental goal of PPBS. It takes off from a meaningful structure for planning and makes possible realistic appraisal of the degree to which the performance has fulfilled the plan.

The environment never stands still and the Defense management control process in the United States is constantly seeking to overtake a continually changing problem. Project PRIME may represent a large enough step to overcome this situation for a while and, thus, gain some time for beleaguered Defense managers. It will, at least, restore to the legislature visibility with respect to Defense matters that some believe has been seriously eroded over 130 years, and will materially assist in the proper discharge of its constitutional responsibilities.

PPBS is no panacea. It is a good idea, a part of an evolutionary stream of ideas. It requires refinement and innovation if it is to remain useful in coping with a dynamic environment moving at an accelerating pace.

Industrial Security—Is it Necessary?

by

Capt. Frank Larsen, USN

Occasionally we hear the complaint that security controls create bottlenecks for industry, however, more and more businessmen today are recognizing that security procedures within their operation are as much a part of their businesses as budgeting, planning, production, or auditing.

Why are industrial security controls necessary? For this simple reason: to deter espionage against industrial capacity of the United States. In analyzing the espionage threat there is often a tendency to go to extremes. There are those who would magnify all aspects of the threat and so become prophets of gloom. Others would discount the capabilities of hostile espionage and magnify their internal difficulties. However, it is always more dangerous to underrate than to overrate an enemy. For instance, U.S. experts predicted in 1946 that the Soviet Union would not have an atomic bomb before 1960. The world was shocked when the Russians exploded their first bomb in 1949, eleven years in advance of the predicted date. Our scientists made this estimate, based on the lead time needed to develop a workable device for this nation. This 11-year pole vault in technology can be attributed in part to the Communist's success in espionage—successful in that they were able to steal vital elements of information that reduced the lead time they needed to develop this bomb and at the same time avoid the errors and trials that we encountered before success was achieved. We need only look at today's newspapers to recognize that the hostile threat of espionage directed toward the United States appears to have increased rather than diminished. We must be prepared to meet this hostile threat.

In order to clearly understand the relationship of industrial security to the process of manufacture of defense products, it is necessary to break down the process of production. First there is the idea. This is the beginning of lead time. Lead time is defined as the time span beginning when any defense project, program, or system originates an idea in the mind of someone either in industry or in the Government and extending to its completion or production. Once the idea is deemed to be so vital to our defense that its compromise would affect adversely our national defense interest, a classification, indicating the degree of importance to our national defense, is applied to the idea. The next step is to research and develop the idea, i.e., take it from the idea stage and place it into a tangible form such as a drawing, specification, or proposal. Industry most frequently is designated as the research and development agency. From this stage the project goes into testing of a prototype or model. Testing is done either by industry or by the Government. In any event, through these three stages of what we call lead time, industry is entrusted with vital defense information.

The next stage is production. In the production stage, protection of information by industry must be afforded and must extend in many instances through the stage of delivering the product into the ultimate possessor's hands. When the product is in the hands of the Government, we feel that the secret has been kept. However, industry is still afforded access to the information by virtue of continued production of the system, or the necessity to maintain or perhaps modify it. The period from the conception of an idea to the realization of the end product in the possession of the Government may be weeks, months and even years. Throughout this period of lead time, many people in industry, as well as in Government, will be afforded access to the classified information involved.

Capt. Frank Larsen, USN, is the Chief of the Office of Industrial Security, Defense Contract Administration Services, Defense Supply Agency. He was assigned to DSA in 1965 as Chief of the Field Management Division. In this position he had responsibility for the management of the military and civilian security personnel in the 11 Defense Contract Administration Services Regions across the country.

The real objective of the industrial security program is to maintain the security of classified information throughout its life, from its birth as an idea until such time as the proper authorities in Government determine that it can be declassified.

How do we achieve this objective? One method might be cooperation, which implies the dual effort of industry and Government. If industry does its part and Government carries out its obligations throughout the period of production, security can be maintained.

The Defense Industrial Security Program is the Government's technique for protecting classified defense information entrusted to defense contractors. The technique is set forth for industry in the "Industrial Security Manual for Safeguarding Classified Information" (Attachment to DD Form 441). The manual is the book of rules for carrying out a specific security agreement signed by the Government and the defense contractor. The requirements of the manual are both realistic and practical having evolved from many years of experience in countering espionage activity.

While it might appear that security requirements have been expanded in the latest edition of the manual, the principles of the original document have not changed. Specifics as to techniques have been set forth and samples of forms and other guidance have been published to assist the contractor in doing a better job in safeguarding vital information entrusted to him.

A simple formula, which explains how the program works, is this: a "clearance" plus "need-to-know" equals "access." In effect this formula indicates that before an individual is authorized access to classified defense information, he must have an appropriate company and personnel security clearance equal to, or higher than, the degree of classification of the information to which he requires access. Hence we come to the second part of the formula which is equally important: a need-to-know the information in order to accomplish an official objective. One without the other of these two elements indicates that the person is unauthorized. If unauthorized he cannot legally be afforded access to classified defense information.

We feel that our efforts in Government are only partially successful if we merely set forth requirements. The major portion of the mission must be accomplished by industry—industry must implement the program in industry. We assist, advise and monitor the individual contractor to insure that the program he has in effect meets the requirements of his security agreement with the Government.

Within the Industrial Security Manual are set forth all the specifics that are needed in order to maintain a successful program within a contractor's facility. It takes an organization in order to set forth the requirements, render advice and assistance, and then monitor these requirements as industry implements them. This organization is the Office of Industrial Security under the Deputy for Contract Administration Services of the Defense Supply Agency (DSA) at Cameron Station, Alexandria, Va.

There are three divisions in this office:

- The **Programs and Systems Division** establishes policy and procedure—the Industrial Security Regulation, which controls the Government's requirements; the Industrial Security Manual, which establishes industry requirements; the Cryptographic Supplement to that manual for these contractors who will require access to cryptographic information; the Industrial Security Operating Manual for Government field personnel; and other publications, such as industrial security letters to contractors and industrial security bulletins to Government agencies.
- The **Field Management Division** maintains operational control over the Offices of Industrial Security in the 11 Defense Contract Administration Services Regions to assure a uniform application of the program nationwide.
- The **International Programs Division** is a new element within the Industrial Security Program. Its establishment was necessitated by the initiation of sales of U.S. defense hardware to allied nations. When classified information becomes involved in doing business with foreign contractors, the International Programs Division acts as a catalyst between the United States and foreign governments and their contractors. In addition, when foreign governments or contractors desire to place foreign classified jobs in U.S. industry, it is the mission of the International Programs Division to assure that their classified information is protected.

In addition to the central Office of Industrial Security at DSA headquarters and the 11 regional offices across the nation, a central Defense Industrial Security Clearance Office (DISCO) was established to process security clearances of industrial employees. DISCO was established in Columbus, Ohio, in March 1965. It was the result of a consolidation of Army, Navy and Air Force industrial security offices. It is to this office that contractors, once they have a facility security clearance, direct their requests for employee clearances. Files of all contractor employees' clearances totaling over a million and a half, which the Defense Department has issued to date, are maintained in this office. The files also contain a central record of all cleared U.S. defense contractors, totalling nearly 15,000 facilities.

Each Defense Contract Administration Services Region has an Office of Industrial Security which functions as the cognizant security office for all defense contractors in its geographical area. It is from this office that clearances of facilities are issued and it is here that contractors' programs for the protection of classified defense information are monitored.

It might appear that the mission of the Office of Industrial Security is well under control; that there are no further requirements. But improvements are coming.

Computers, for example, constitute a new technology in the processing of classified defense information and record keeping. Contractors and the Government are developing new standards for insuring security of the information processed by these machines. We are attempting to speed up our clearance actions for company employees as well as for new facilities.

We are constantly striving to improve the quality of our security inspections. An industrial security representative in the field does a disservice to industry when he does not point out where it is deficient. We are satisfied that industry will do an adequate job if it knows what to do, is given advice as to how to accomplish it, and is periodically monitored to assure that the application of procedures is current. This confidence to date has not been misplaced.

Much progress has been made in the approximately two years that consolidated industrial security has been in operation. Industry is implementing the program. In fact, the majority of all cleared defense contractors maintain at least an adequate industrial security program today. In instances where deficiencies exist, contractors have taken the most expeditious action to correct them, thereby improving their programs.

The Government security team is exerting the maximum effort to prevent hostile espionage. Success of the program depends on industry's efforts to carry it out.

Contractors Cited for Zero Defects

The highest honor in the Zero Defects Program an Air Force prime contractor can receive has been accorded to eight defense firms in recognition of outstanding records in the field of industrial zero defects during the past 18 months.

Presented for the first time, the Air Force Craftsmanship Awards went to three divisions of the Radio Corporation of America—the Astro-Electronics Div., Princeton, N.J.; Communications Systems Div., Camden, N.J.; and Missile & Surface Radar Div., Moorestown, N.J.

Other contractors who received awards are the General Electric Co., Flight Propulsion Div., West Lynn, Mass.; General Electric Co., Evendale Facility, Cincinnati, Ohio; Lockheed Missile & Space Co., Sunnyvale, Calif.; Aerojet General Corp., Sacramento, Calif.; and Douglas Aircraft Co., Missile & Space Systems Div., Huntington Beach, Calif.

To win the Craftsmanship Award, each firm showed performance records for at least 18 months clearly reflecting achievements against pre-set goals. Contract administration personnel with either the Air Force Systems Command's Air Force Contract Management Div., Los Angeles, Calif., or the Defense Contract Administration Services validated the performance data and determined the adequacy and realism of the goals.

A select number of employees from the eight firms are being given Craftsmanship Award pins and their names are inscribed on an accompanying scroll. In addition, Zero Defects banners go with the award and are being formally presented to the employees as a group.

Army Pilot Training Increased

The U.S. Army is planning to temporarily increase its monthly training quota of pilots from 410 to 610 and plans to expand existing facilities to handle the increased training load.

All primary helicopter training is now conducted at Fort Wolters, Tex., which will be expanded to handle additional trainees.

To provide additional training facilities, the planned close-out of Hunter AFB, Ga., will be extended beyond next July and will be used in conjunction with the Army's nearby post at Fort Stewart, Ga.

Advanced flight training and transition training are now carried out at the Army Aviation Center, Fort Rucker, Ala. Various tests and development activities are also performed there.

Air Force Participation in the Development of SAIMS

by

Lt. Col. Hans H. Driessnack, USAF
Asst. to Dep. for System Management
Office of Asst. Secretary of the Air Force (Financial Management)

During the last few years we have witnessed an increase in activity in DOD directed toward improving management in the weapons acquisition process. Some of this activity has resulted in the issuance of DOD directives and manuals to which the Services and industry have been required to respond. The most notable of these have been: DOD/NASA PERT Cost Guide; DOD Directive 7041.1, "Cost and Economic Information System (CEIS);" and DOD Directive 3200.9, "Contract Definition."

More recently, the Defense community has been exposed to some new nomenclature in the form of Resource Management Systems, Assets Management Systems, Selected Acquisitions Information and Management System (SAIMS), Cost Information Reports (CIR), Contract Funds Status Report (CFSR), and a Performance Measurement System.

Simultaneously, the Air Force has also been engaged in an extensive effort to improve its overall management capability in this area. Manuals on configuration management and management of contractor data and reports are products of this general effort.

Still another project being undertaken by the Air Force Systems Command (AFSC) has been directed toward improving the command's capability to develop credible cost estimates and strengthening the command's program cost control capability. Some of the results of this effort have been the AFSC Cost Information System (CIS) and Cost Accomplishment System.

This apparent proliferation of management systems, with their attendant reporting requirements, is undoubtedly the most talked about and least understood effort currently under way in DOD. The purpose of this article is to place these various efforts in proper context and to describe the Air Force approach for an improved financial management system which satisfies the DOD concepts and objectives.

The DOD Framework.

During the past several months, the Assistant Secretary of Defense (Comptroller) has made several public pronouncements concerning Resource Management Systems. He has defined Resource Management Systems as "all the systems that aid DOD management in their task of assuring that resources are obtained and used both effectively and efficiently in the accomplishment of DOD objectives." The systems which are included within this definition are:

- **Programming and Budgeting System**—concerned with the process of planning for resources to meet stated objectives and justifying these needs to Congress.
- **Operating Management System**—directed toward the management of resources applied directly to and in support of the operating commands in DOD.
- **Inventory Management System**—concerned with the process of planning and control of the myriad of items which flow through DOD's gigantic supply systems.
- **Acquisitions Information and Management System**—concerned with the management of weapon and support systems acquisition process.

The last two system areas—Inventory Management System and Acquisitions Management System—are combined under the heading of Assets Management. This is graphically presented in Figure 1.

The first three areas are primarily concerned with DOD in-house management functions; however, the fourth area—Acquisitions Information and Management System—requires close involvement with industry. A more complete discussion of this area is the real objective of this article.

Selected Acquisitions Information and Management System (SAIMS).

Under the heading of Acquisitions Information and Management System, there exist several subsystems, each of which requires some interchange between DOD and industry. There are basically two categories of subsystems—one specifically concerned with "selection" acquisitions and one directed at "other" acquisitions. The first category has been named Selected Acquisitions Information and Management System (SAIMS). SAIMS is defined as the system concerned with

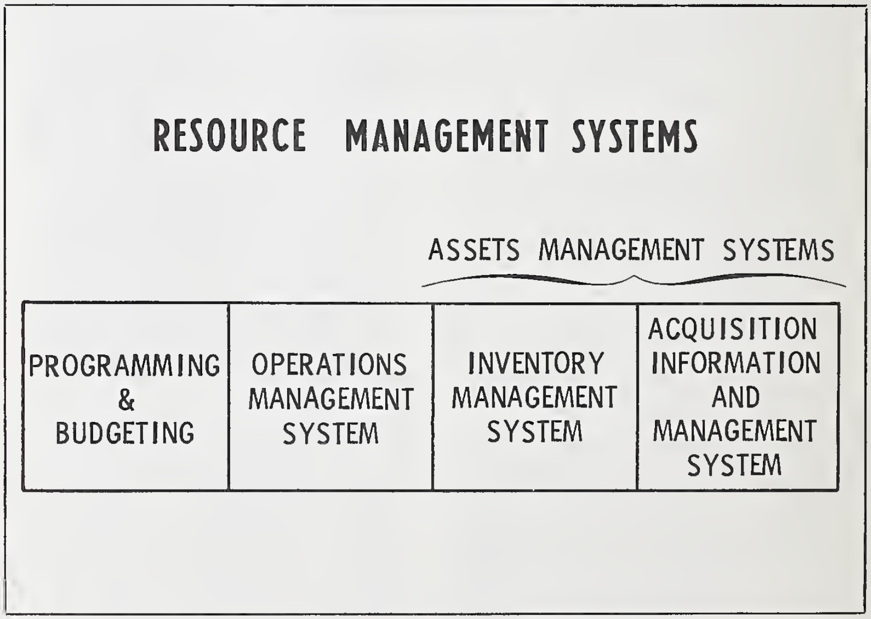

RESOURCE MANAGEMENT SYSTEMS
ASSETS MANAGEMENT SYSTEMS
PROGRAMMING & BUDGETING
OPERATIONS MANAGEMENT SYSTEM
INVENTORY MANAGEMENT SYSTEM
ACQUISITION INFORMATION AND MANAGEMENT SYSTEM

Figure 1.

the management of the acquisition of selected capital assets. This is the process of acquiring weapon and support systems of the quality and configuration needed by DOD, on schedule and at lowest cost. The relationship of the components of SAIMS within the overall Resource Management Systems effort is illustrated by the diagram shown in Figure 2.

The SAIMS concept can be considered as a reorientation and consolidation within a single DOD framework of several components that have been undergoing development for some time. Referring to Figure 2:

- Items two, three and four, prior to reorientation, were the basic parts of the DOD Cost and Economic Information System (CEIS).
- Items three and four were included as basic components of the AFSC Cost Information System (CIS). CIS, initially outlined in AFSC Letter 173–2, Oct. 1, 1965, was essentially an integration of several contractor cost reports (similar to the CIR and CFSR then under development) and four in-house reports The approved DOD reports for CIR and CFSR have now replaced their AFSC counterparts in the CIS, as planned, thus insuring that no overlapping or duplicate reporting requirements exist.
- Items five and six are treated in the current draft specification on Schedule and Cost Planning and Control, originated by the Office of the Secretary of Defense (OSD), and embody the same concepts contained in a similar specification currently in use by the Air Force.

Economic Information System (EIS).

The Economic Information System reports are concerned with plant-wide information as well as program-oriented information. EIS is designed to collect the data necessary for analysis of the economic impact of defense spending by geographical area and industry. It requires reporting on many programs and includes data on commercial as well as Government sales.

Contract Funds Status Report (CFSR).

The Contract Funds Status Report was developed to provide information about contract funding requirements by fiscal year for specific programs to assist the program director in:

- Updating and forecasting contract fund requirements.
- Planning and decision making on changes in fund requirements.
- Developing fund requirements and budget estimates in support of approved programs.

Where specifically designated in contracts, this report will supersede use of the familiar DD Form 1097 and other similar funds status reports.

Cost Information Reports (CIR).

The Cost Information Reports have been approved by the Bureau of the Budget. There has been a general orientation effort explaining CIR to industry sponsored by the Office of the Assistant Secretary of Defense (Comptroller). Since DOD documents on CIR are now available, it will not be discussed in any detail in this article. However, in order to clarify how CIR fits into the overall SAIMS effort, some general comments are required concerning what CIR is, and is not.

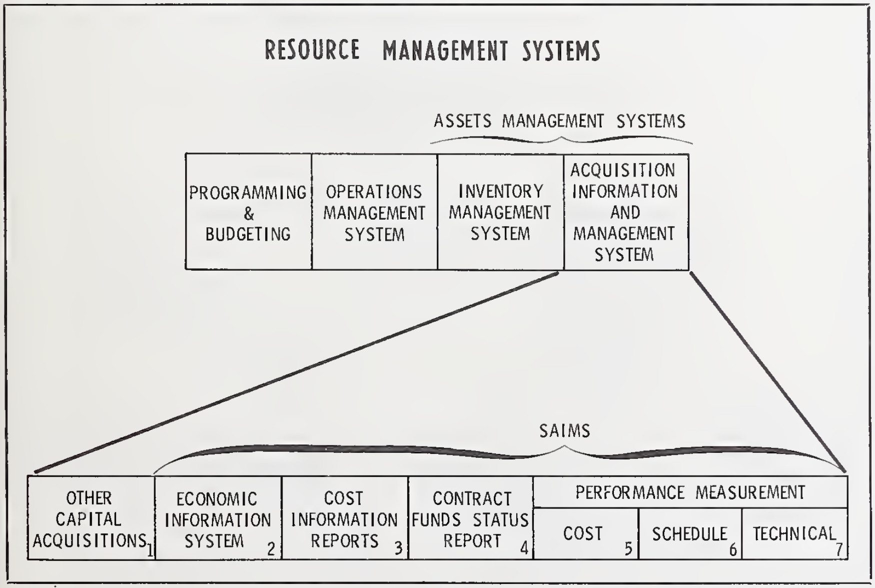

RESOURCE MANAGEMENT SYSTEMS
ASSETS MANAGEMENT SYSTEMS
PROGRAMMING & BUDGETING
OPERATIONS MANAGEMENT SYSTEM
INVENTORY MANAGEMENT SYSTEM
ACQUISITION INFORMATION AND MANAGEMENT SYSTEM
SAIMS
OTHER CAPITAL ACQUISITIONS 1
ECONOMIC INFORMATION SYSTEM 2
COST INFORMATION REPORTS 3
CONTRACT FUNDS STATUS REPORT 4
PERFORMANCE MEASUREMENT
COST 5
SCHEDULE 6
TECHNICAL 7

Figure 2.

CIR was developed primarily to provide information on actual costs, incurred as well as estimated costs, to complete programs throughout the acquisition cycle of a program in a consistent manner. The data will be used in support of cost estimating, programming, budgeting and, where applicable, procurement activities. Additionally, this same information will be used as input to a data bank for use in developing cost estimating relationships and cost estimates for future programs. The mechanism for controlling the use of CIR reports is the CIR Data Plan, indicating the items to be covered by the report and the level of detail. A CIR Data Plan must be submitted for each weapon/support system where CIR is to be implemented. The plan must be reviewed and approved by the OSD CIR Data Plan Review Committee prior to implementation.

It should be understood, however, that CIR and the requirements for CIR Data Plan approval will in no way be construed to prescribe or limit the information, format, or detail of non-recurring information that may be required of a contractor in support of Requests for Proposal or contract negotiations.

Additionally, and equally important, it should be recognized that CIR was not designed to satisfy the status reporting or program control requirements of the program director. This requirement is being addressed in the Performance Measurement System.

Performance Measurement System

A DOD working group has examined the performance measurement component of SAIMS. Recognizing that there are many different ways of putting together effective management systems, the intent of this group was to develop a basis for providing uniformity of approach within DOD. The recommended solution was to develop a model specification which does not specify procedural detail, but does spell out criteria, general characteristics and desired reporting requirements. Where effective management control systems are in use by contractors, there is no intent to change them. Rather the approach is to interlock the Government reporting requirements directly with contractors' internal systems.

Having discussed how the various systems and components fit into the overall Resource Management Systems framework, the next area that requires some explanation is the current Air Force efforts to respond to the overall DOD framework and, more specifically, the DOD SAIMS development program.

The Air Force Approach to an Integrated System.

In the past, Government management systems have frequently addressed only fragments of the total management information problem. Typically, too little thought has been given to the relationship of the subsystems or components to overall information requirements. This kind of approach has often resulted in overlapping or duplicate requirements, omissions, confusion and, in the end, ineffective systems.

While we are still addressing the overall information problem by its components, we are now doing so with the total system design well in mind. Additionally, we are providing the flexibility to add the other related components as they are developed.

The Air Force has recognized that what is really new in the design of management systems within DOD is uniformity of approach to provide the information needed without a disproportionate diversion of resources by the Services and industry. While all areas of reporting are continually being reviewed, particular emphasis has been placed in the area of financial management information. Under the guidance and direction provided by the Assistant Secretary of the Air Force (Financial Management), the Air Force has been working to develop a financial management information reporting structure which recognizes the real need for different kinds of financial data, yet minimizes the volume and variety of reports required by relating them to each other in a single integrated framework. In addition, the financial data is directly related to schedule and technical performance information.

Since the focal point for systems management is the System Program Office (SPO), and since the Air Force point of contact with industry is also the SPO, the logical place to integrate any management system requirements into a meaningful product is at the SPO level. The approach being taken provides the overall framework within which the SPO can more effectively exercise its business management responsibilities and can also be more responsive to higher echelon requirements. There are three key areas which tie this approach together into a single meaningful system:

- An integrated financial management reporting system which provides useable summary data for all echelons of the Air Force.
- A specification for program planning and control which outlines the criteria that an acceptable system must meet.
- An integrated work breakdown structure which requires both Air Force and industry participation in order to identify all elements with which the contract is concerned.

Financial Management Reporting Structure.

There are currently nine major programs in the DOD program budget structure. Each of the programs is separated into elements and for each of the program elements the cost categories of research and development, investment, and operating costs are considered. However, in SAIMS we are concerned primarily with the research and development and investment costs of the major program elements. To illustrate the foregoing: Program IV, Airlift, contains, as a program element, the C–5A. This is a major support system which is a selected acquisition and has been designated for management emphasis.

The primary management document within DOD for communicating what the currently approved plan is for any given program element is the Five Year Defense Program (FYDP). The Services are required to document their requirements in support of the Five Year Program and any changes that may be made to it. This is normally accomplished by the SPO using inputs from all contractors and Government agencies concerned with the program. This information is consolidated, analyzed and submitted through channels to OSD as a Program Change

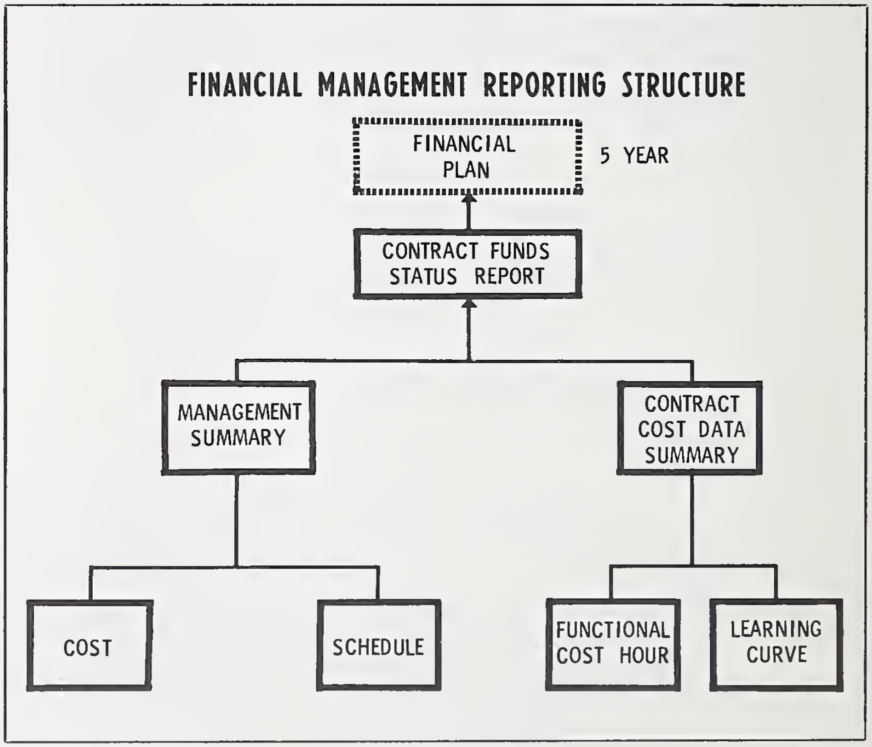

FINANCIAL MANAGEMENT REPORTING STRUCTURE
FINANCIAL PLAN
5 YEAR
CONTRACT FUNDS STATUS REPORT
MANAGEMENT SUMMARY
CONTRACT COST DATA SUMMARY
COST
SCHEDULE
FUNCTIONAL COST HOUR
LEARNING CURVE

Figure 3.

Request (PCR). If the change is approved, the Five Year Program is amended and funds are made available, or deleted, to cover the revised program.

Contract Funds Status Report (CFSR).

In the Air Force, the reporting documents submitted by industry to the SPO, outlining contract funds requirements, have been the DD Form 1097, Contractor Financial Requirements Estimate (CFRE), and local forms. The Office of Assistant Secretary of Defense (Comptroller) is currently developing a Contract Funds Status Report (CFSR) for this purpose. This report, when requested by the SPO, will replace the DD Form 1097 and all similar funds status reports in current use.

The CFSR is designed to provide funds information by fiscal year. This report enables the Air Force to provide OSD with a more detailed analysis of total fund requirements and identifies the basis on which the Five Year Program estimates were made, i.e., whether future requirements are on contract, authorized, identified, or merely contemplated.

However, the projection of fund requirements for future years means very little unless it can be supported by actual cost experience and some measure of performance against the program requirements to date. The reporting structure showing this kind of a relationship is shown in Figure 3.

The Contract Cost Data Summary was designed to provide cost data for the total contract broken out by recurring and non-recurring costs. Though primarily designed to collect actual cost data for analysis in support of budget requests and PCR's, the same cost data are input to a cost data bank for developing cost estimating relationships and cost estimates for future systems.

For selected hi-value items, such as airframe and engine, which constitute a significant part of the costs of a total system, further backup is required. For these selected items a Functional Cost Hour Report may be required to be submitted along with the Contract Cost Data Summary.

In those cases where the system is entering production, a Progress Curve Report may also be requested for the selected hi-value items cited above. These reports, which provide a different grouping of the cost data, serve as additional backup information in support of PCR's, budget requirements, future estimates, etc. Cost data from these reports also provide input to the data banks.

The reports described in the foregoing provide basically the same information most major contractors have previously submitted to the Air Force as a requirement of the Contractor Cost Study.

These reports do not satisfy the program director's management information requirements, however.

A Management Summary Report of some type is required on a monthly basis to provide an assessment of the contractor's performance to date against contract requirements. It should answer the questions: What is the value of work accomplished to date? This report should be derived from the contractor's internal planning and control system. It should contain traceable information from the contract line items through the contractor's internal control systems and be capable of flagging potential problems in sufficient time to permit corrective action. This same report will also assist in the analysis of fund requirements.

The Management Summary Report should be supported by narrative problem analysis and/or variance analysis reports designed to provide an assessment of actual and potential problem areas (whether they be cost, schedule, or technical) which impact on contract performance.

The reporting structure, shown in Figure 4, has been developed in such a way that the reports are interrelated, serve the SPO's financial management reporting requirements, provide the information required for higher level budgeting, programming and PCR procedures, and satisfy the SAIMS objective. Particularly important is the fact that all of the reports are derived from the same basic contractor data. However, for the reported information to have real value, the data must not only be derived directly from the contractor's systems, it must also represent the way the work is actually accomplished and the costs are actually accumulated.

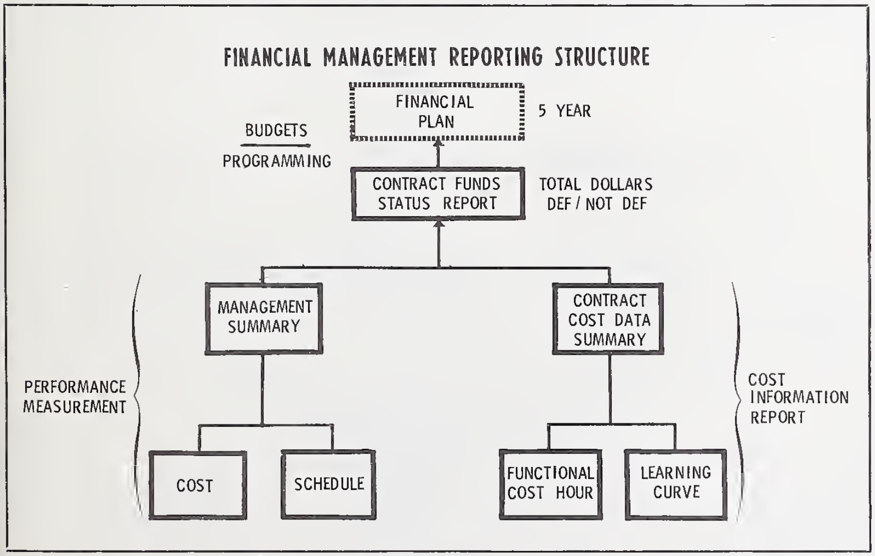


Figure 4.

Criteria for Evaluating a Contractor's System—A Specification

In past years a number of techniques have been developed within DOD specifically designed to provide some measure of contractor performance, particularly in the area of costs and schedule.

While the basic concepts and objectives of most of the techniques developed were very similar, they usually resulted in additional reports being levied on the contractor.

These techniques, like PERT COST, were often indiscriminately implemented—sometimes on top of perfectly valid existing contractor systems—and the end result was a redundant reporting system developed solely to satisfy the specific technique.

For various reasons reports generally were not tied into the contractor's actual operating systems. Consequently, the reports, generated solely to satisfy Government reporting requirements, did not really reflect the true status of the program being reported on.

We have now come to realize that any valid measurement of contractor performance must derive directly from the contractor's internal planning and control system. Further, where valid planning and control systems exist, we should use them and not try to impose another system on top of them. The evolution of this approach is shown in Figure 5.

The Air Force approach to a solution of this problem is to stop imposing rigid techniques and, instead, to outline the basic criteria which a contractor's internal planning and control system must meet to satisfy our requirements. These criteria, which are based on the way a well managed contractor conducts his business, are embodied in a specification. The major point here is that the contractor is being given the basic criteria that his internal system must meet, and not the mechanical detail of an externally designed and rigidly imposed system.

Since many management functions must be served by information derived from a contractor's management control system, and a contractor's flexibility in deciding how most effectively to manage his activities is to be preserved, a specification approach is considered essential. In general, the specification requires that the contractor operate one integrated planning and control system to support both his internal management of the program and for reporting cost and schedule information to the Government. This information can then be progressively summarized for higher levels of management. A joint evaluation team assures the mutual understanding and acceptance of the system in meeting the needs of both contractor and Air Force management.

We think that this is a practical approach and, as a matter of fact, have several major contractors currently operating under this concept.

Integrated Work Breakdown Structure (WBS).

A planning and control system meeting the Air Force specification will be based on an integrated work breakdown structure (WBS) which provides the framework within which the work required to accomplish contract objectives is identified and scheduled, and within which the cost of this work is planned and controlled.

As shown on Figure 6, the upper levels of the WBS are provided by the Air Force and constitute the structure for summary reporting of cost, schedule and related technical information to the Government. Further expansion of the WBS below the specified reporting level is the responsibility of the contractor. A general guideline to follow here is that the WBS must reflect the way in which the work is accomplished.

The lower levels of the WBS will vary from project to project depending on the contractor's organization, design complexity, technical risk, configuration management aspects, reprocurement requirements, etc.

The Office of the Director of Defense Research and Engineering (DDR&E) is currently engaged in a project to develop uniform work breakdown structures, at the summary level. By limiting the selection of uniform elements of the WBS to the upper levels (the top three) and specifying guidelines for extension below this point, uniform summary structures essential for management reporting and decision making are provided. At the same time flexibility of the content of the lower levels, required to accommodate varying contractor operations, is preserved.

One point not clearly understood by many is that the complete WBS does not automatically emerge at the beginning of the program. Its development evolves through the definition phase, or its equivalent, and normally is not totally defined until well into the development phase. WBS elements will

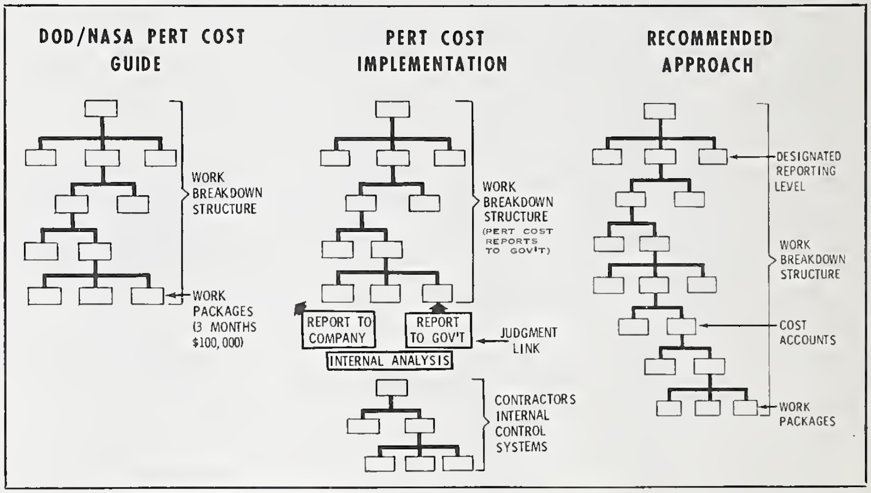


Figure 5.

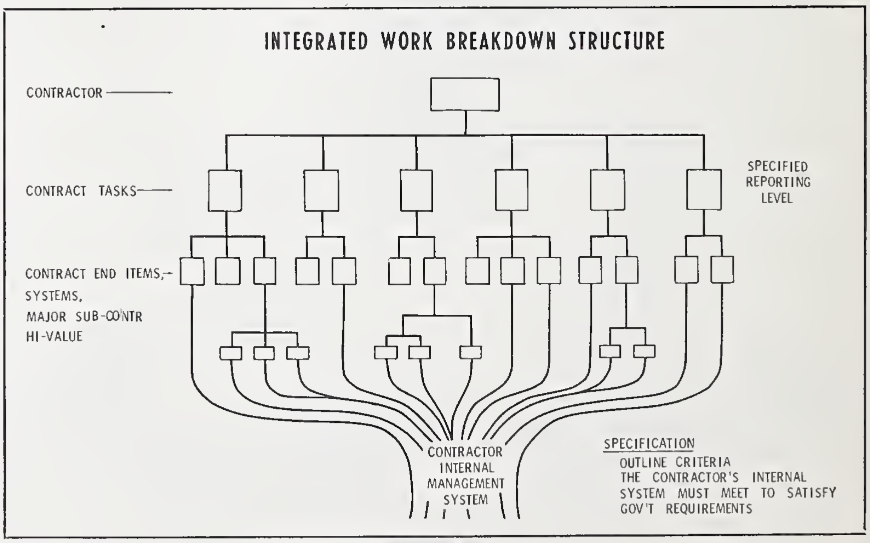

INTEGRATED WORK BREAKDOWN STRUCTURE
CONTRACTOR
CONTRACT TASKS
CONTRACT END ITEMS, SYSTEMS, MAJOR SUB-CONTR HI-VALUE
SPECIFIED REPORTING LEVEL
CONTRACTOR INTERNAL MANAGEMENT SYSTEM
SPECIFICATION
OUTLINE CRITERIA THE CONTRACTOR'S INTERNAL SYSTEM MUST MEET TO SATISFY GOV'T REQUIREMENTS

Figure 6.

evolve as configuration elements (CE's) are identified. Eventually, all the CE's and deliverable end items must be contained somewhere in the WBS. This evolutionary phenomenon is shown in Figure 7.

A WBS, at the summary level, applied at the beginning of the program life cycle will serve as a common thread throughout the life of the program. Initially, it serves as a basis for the preparation of Requests for Proposal, specification tree, contractor responses, and contract line items. It becomes the basis for configuration management, end item identification, CIR data plans and program documentation. As the program evolves, it becomes the basis for identifying consistent reporting categories and for tracking actual performance against the plan.

For a WBS to be responsive to all of the reporting requirements for a given program, the designated reporting structure must be developed in such a way that it can accommodate the way the Air Force contracts for and manages the program. This can be accomplished where contract line items are structured in such a way that they represent natural aggregations of deliverable contract end items. These are the same end items for which performance specifications are written and against which schedules are developed and costs are monitored.

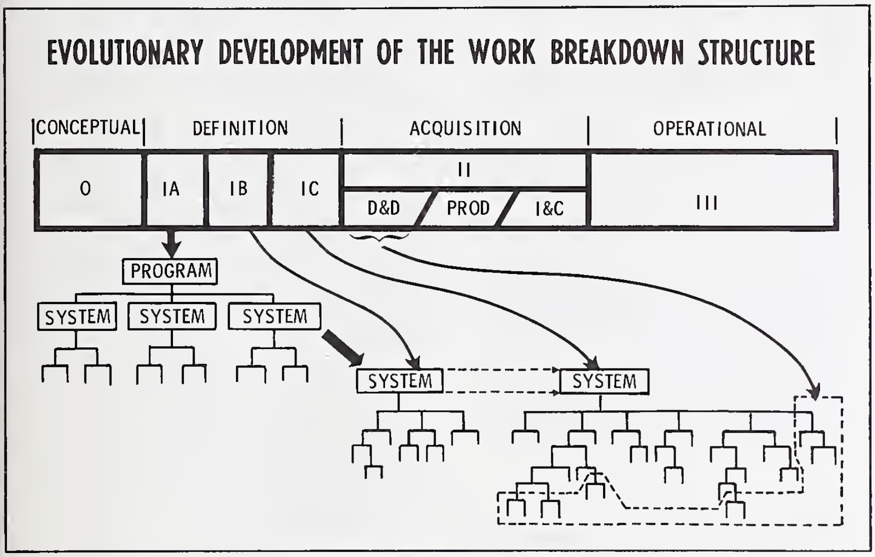


Figure 7.

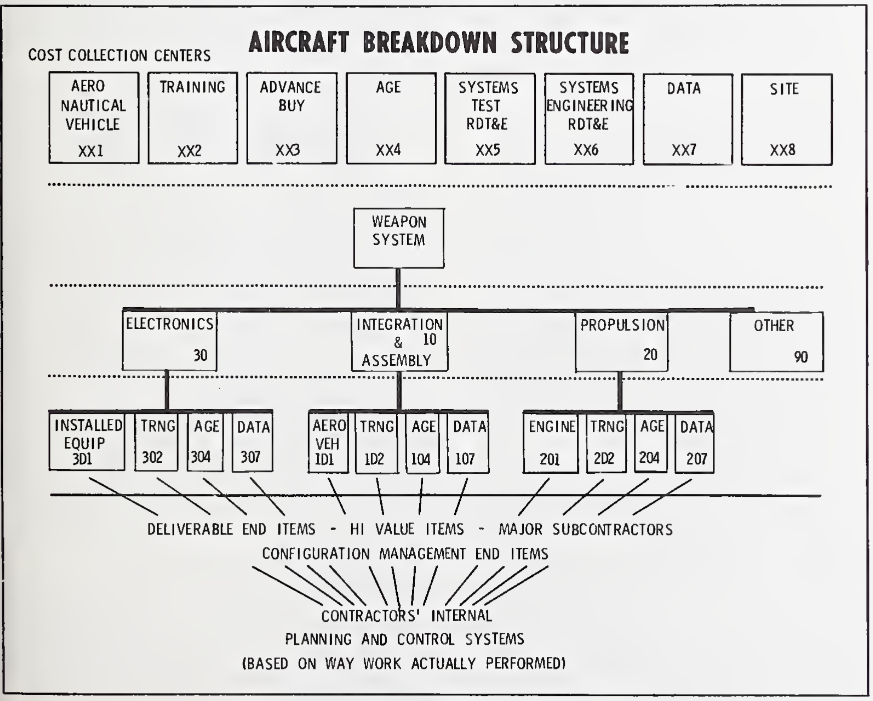


Figure 8.

AFSC is currently preparing a manual standardizing the preparation of work statements which requires just such a correlation. Contract definition procedures also support this kind of an approach. Moreover, several Air Force projects are already following this approach so that the feasibility has been demonstrated.

Much of the confusion surrounding the development of WBS's is caused by rigid application of "total system" structures for each contract in a program. This is not the way we manage our business, however. An example of the current CIR WBS for aircraft is as follows:

Total Aircraft System:

- Air Vehicle
  - Airframe
  - Propulsion
    - Engine
  - Navigation-Electronic System
- Aerospace Ground Equipment
- Training
- Data
- Etc.

In actual cases, the Air Force contracts with a prime contractor to build the air vehicle. Historically, contracts are written separately for propulsion. Normally, we also contract separately for many electronics subsystems (navigation, communications, fire control, reconnaissance, etc.) and each of these separate contracts include appropriate aerospace ground equipment, training and data requirements. It should be quite obvious that the CIR WBS, developed to satisfy total system cost analysis purposes, must be modified somewhat if it is to be responsive to the SPO's total responsibility in managing the program. This can be effectively done, however, by a logical arrangement of the total program structure and some uniformity in identifying contract line items of the many contracts.

A simple coding arrangement provides a way of summarizing total program costs, broken out by selected categories. Schedule and technical information can be related in the same way.

Figure 8 represents an aircraft

WBS developed and coded in such a way that Government furnished aeronautical equipment (GFAE), as well as associated contractor elements, are accounted for. The arrangement of the contract line items are the key. They should normally represent natural aggregations of deliverable end items. These are the same end items which require technical specifications and against which we monitor schedules. We also should know how much they cost. A WBS properly developed to this level permits vertical cost summations against any given contract and horizontal summations for the total program as backup for PCR's and as required to support budget submissions. While the example shows only three contracts, any number can be accommodated in the same way. The codes are examples of Air Force Material Program Codes (MPC). Looking at the contract line item level, it can be seen that summation of third digit 1 produces total Aeronautical Vehicle Flyaway, summation of third digit 2 produces total Training, summation of third digit 4 yields total Aerospace Ground Equipment, etc.

Performance Measurement Data Requirements.

In a well designed management system, information should be reported in such a way that only data of value or interest to a given level of management are routinely reported at that level. There is no real mystery in identifying the basic information needs for management at any level. They are simply the data required for periodically evaluating actual performance against the plan. For example, where the plan is presented at a high level of summarization, progress reporting against the plan will be at the same summary level. However, at that management level where the plan is in great detail, summary data are inadequate for assessing actual progress against the plan.

In an effort to increase the usefulness of the Air Force Management Summary, the Assistant Secretary of the Air Force (Financial Management) has directed that performance measurement information for selected major programs, relevant to the Headquarters, USAF, level, be provided on a routine basis through normal reporting channels. These data elements, which will soon be incorporated in standard formats by AFSC and Headquarters, USAF, are as follows:

Funds:

Authorized program.
Approved funds by appropriation and by fiscal year.
Expenditures to date.
Total Air Force commitments.

Contract:

Initial negotiated value.
Current negotiated value.
Authorized, though not yet negotiated, amount.
Proposed additional work.
Monetary limitations, if any.

Costs:

Unit Costs—actual cost of completed units plus equivalent units in process.
Planned value of work accomplished to date.
Planned value of work scheduled to be accomplished to date.
Actual costs incurred.
Variance analysis.
Estimate of costs at completion.

Schedule:

Planned schedule of selected program milestones (e.g., selected technical achievements, schedule incentives); planned schedule of end item deliveries.
Estimated achievements of milestones.
Actual achievement of milestones.
Variance analysis.
Projected outlook.

Technical:

Technical achievements tied to contract incentives.
Quantitative expression of progress in achieving technical and operational objectives.
Variance analysis.
Projected outlook.

In summary, the approach being taken by the Air Force not only fits into, but has actually been developed with the total SAIMS framework in mind.

- Basic cost and schedule data are derived from the contractor's internal system and reported to the Air Force at a summary level. Cost and schedule data are related to technical performance at an appropriate level. A specification outlines the minimum criteria that a contractor's internal planning and control system must meet to satisfy Air Force requirements.
- An integrated reporting system satisfies requirements for data of SPO/AFSC/USAF/OSD.

This integrated approach satisfies the objectives of performance measurement and CIR, is responsive to requirements for budget estimates and PCR's, and accommodates the engineering management requirement of contract definition and configuration management.

ARPA Establishes New Engineering Office

The Advanced Research Projects Agency (ARPA) of the Defense Department has established an Office of Advanced Engineering to provide a means for supporting developments in engineering which do not ordinarily come under the charters of ARPA's other offices and which are not funded by the Military Services, but which could have significant benefit to DOD.

Tasks to be carried out by the new office will be either self-generated or will result from recommendations by the Office of the Director of Defense Research and Engineering and other DOD elements.

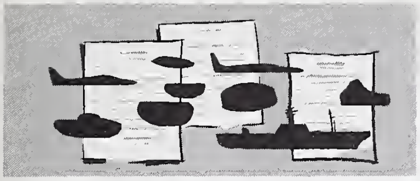
Dr. Chiao Jen Wang, formerly of Booz-Allen Applied Research, Inc., has been selected to head the new ARPA office. Dr Wang has been serving as Deputy Director of Booz-Allen's combined Arms Research Office.

Oklahoma City AMA Gets A–7D Logistics

The Air Force Logistics Command (AFLC) has announced the assignment of logistics management responsibility for the A–7D aircraft to the Oklahoma City Air Materiel Area (OCAMA), Tinker AFB, Okla. The A–7D is a modified version of the Navy's A–7 Corsair II attack plane.

OCAMA representatives will begin working immediately with the Air Force Systems Command, Naval Air Systems Command and the contractor (LTV, Inc.) to insure that a high level of logistics support is available to users of the aircraft when it enters the inventory.

Colonel C. C. Kennedy, formerly assigned to the Directorate of Operations at AFLC headquarters, has been designated System Support Manager (SSM) for the aircraft at OCAMA. No logistics management assignment has yet been made on the aircraft's TF–41 engine.



DEFENSE PROCUREMENT

Contracts of $1,000,000 and over awarded during the month of December 1966:

DEFENSE SUPPLY AGENCY

2—**Neptune Garment Co.**, Boston, Mass. $1,188,810. 27,000 men's wool garbardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

—**American Tent & Canvas, Inc.**, Lafollette, Tenn. $2,696,220. 6,000 large general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

—**Gentex Corp.**, Carbondale, Pa. $2,374,970. 27,632 combat vehicle crewmen's helmets. Defense Personnel Support Center, Philadelphia, Pa.

—**Columbus Mills**, Columbus, Ga. $1,036,473. 1,728,000 sq. yds of non-metallic insect screening. Defense Personnel Support Center, Philadelphia, Pa.

5—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for JP–4 jet fuel:

Standard Oil Co. of Calif., San Francisco, Calif. $21,225,229. 204,051,000 gals.

Humble Oil & Refining Co., Houston, Tex. $21,218,700. 229,000,000 gals.

Texaco Export, Inc., New York City, N.Y. $16,091,880. 126,000,000 gals.

Mobil Oil Corp., New York City, N.Y. $14,662,396. 151,372,880 gals.

Union Oil Co. of Calif., Los Angeles, Calif. $9,606,987. 97,146,000 gals.

Continental Oil Co., Houtson, Tex. $9,317,674. 91,895,000 gals.

Sinclair Refining Co., New York City, N.Y. $8,390,760. 84,000,000 gals.

American Oil Co., Chicago, Ill. $8,281,904. 85,055,000 gals.

Coastal States Petrochemical Co., Houston, Tex. $8,055,575. 76,859,768.

Ashland Oil & Refining Co., Ashland, Ky. $7,714,258. 80,101,000 gals.

Cities Service Oil Co., New York City, N.Y. $7,581,814. 80,220,000 gals.

Phillips Petroleum Co., Bartlesville, Okla. $5,098,321. 51,325,000 gals.

Gulf Oil Corp., New York City, N.Y. $4,145,400. 42,000,000 gals.

Shamrock Oil & Gas Corp., Amarillo, Tex. $3,603,054. 35,660,000 gals.

American Petrofina Co. of Texas, Dallas, Tex. $3,401,675. 36,500,000 gals.

Suntide Refining Co., Tulsa, Okla. $3,204,340. 30,500,000 gals.

Atlantic Richfield Co., Los Angeles, Calif. $3,048,984. 29,400,000 gals.

Golden Eagle Refining Co., Los Angeles, Calif. $2,729,500. 25,000,000 gals.

Good Hope Refineries, Houston, Tex. $2,650,000. 26,500,000 gals.

Tidewater Oil Co., New York City, N.Y. $2,496,600. 22,800,000 gals.

Douglas Oil Co. of Calif., Los Angeles, Calif. $2,427,700. 22,000,000 gals.

MacMillan Ring-Free Oil Co., Los Angeles, Calif. $2,169,000. 20,000,000 gals.

Triangle Refineries, Houston, Tex. $2,030,952. 18,480,000 gals.

Fletcher Oil & Refining Co., Wilmington, Calif. $1,889 400. 18,000,000 gals.

Golden Eagle Refining Co., Los Angeles, Calif. $1,662,300. 15,000,000 gals.

Hess Oil & Chemical Co., Perth Amboy, N.J. $1,580,000. 16,000,000 gals.

Signal Oil & Gas Co., Houston, Tex. $1,542,240. 15,120,000 gals.

Marathon Oil Co., New York City, N.Y. $1,477,098. 15,960,000 gals.

Sunray DX Oil Co., Tulsa, Okla. $1,453,480. 15,500,000 gals.

Hercules Oil Co., San Diego, Calif. $1,421,717. 12,325,000 gals.

Mohawk Petroleum Corp., San Francisco, Calif. $1,349,460. 12,600,000 gals.

Hunt Oil Co., Dallas, Tex. $1,236,240. 13,600,000 gals.

Kerr-McGee Corp., Oklahoma City, Okla. $1,126,800. 12,000,000 gals.

MacMillan Ring-Free Oil Co., Los Angeles, Calif. $1,032,000. 10,000,000 gals.

—The Defense General Supply Center, Richmond, Va., has issued the following contracts for osnaburg cotton sandbags:

Cavalier Bag Co., Lumberton, N.C. $1,756,000. 7,160,000 bags.

Dowling Bag Co., Valdosta, Ga. $1,226,400. 5,000,000 bags.

Augusta Bag & Burlap Co., Augusta, Ga. $1,272,000. 5,200,000 bags.

Continental Bag Co., Crowley, La. $1,462,379. 5,854,000 bags.

6—**Valley Metallurgical Processing Co.**, Essex, Conn. $1,308,947. Atomized magnesium powder. Defense General Supply Center, Richmond, Va.

7—**Moplatex, Inc.**, Sarasota, Fla. $3,428,700. 7,000 medium-size general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

8—**Gulf Oil Corp.**, Houston, Tex. $4,685,409. 14,793,000 gallons of motor gasoline; 21,277,000 gallons of distillate fuels; and 2,661-000 gallons of residual fuels. Defense Fuel Supply Center, Alexandria, Va.

—**Standard Oil Co.**, Louisville, Ky. $2,594,142. 14,846,000 gallons of motor gasoline and 3,192,200 gallons of distillate fuels. Defense Fuel Supply Center, Alexandria, Va.

9—The Defense Personnel Support Center, Philadelphia, Pa., has awarded the following contracts for tropical combat boots:

Bata Shoe Co., Belcamp, Md. $4,546,066. 347,028 pairs.

Randolph Mfg. Co., Randolph, Mass. $3,008,400. 230,000 pairs.

International Shoe Co., St. Louis, Mo. $2,488,000. 200,000 pairs.

Safety First Shoe Co., Nashville, Tenn. $2,264,571. 192,000 pairs.

McRae Shoe Inc., Mount Gilead, N.C. $1,265,015. 98,984 pairs.

—The Defense Fuel Supply Center, Alexandria, Va., has awarded the following contracts for gasoline and diesel fuel:

Cities Service Oil Co., New York City, N.Y. $2,817,231. 600,000 barrels of gasoline, Combat, Type I.

Sinclair Refining Co., New York City, N.Y. $1,317,600. 270,000 barrels of gasoline, Combat, Type I.

Hess Oil & Chemical Corp., Perth Amboy, N.J. $2,175,600. 560,000 barrels of diesel fuel, Grade DF–1.

—**Wales Mfg. Co.**, Boston, Mass. $1,846,725. 45,000 men's wool gabardine overcoats. Defense Personnel Support Center, Philadelphia, Pa.

12—**Centre Mfg. Co.**, Centre, Ala. $1,401,804. 135,440 men's coated nylon twill raincoats. Defense Personnel Support Center, Philadelphia, Pa.

13—**Bonham Mfg. Co.**, Bonham, Tex. $1,275,600. 300,000 cotton poplin wind-resistant coats. Defense Personnel Support Center, Philadelphia, Pa.

14—**California Packing Corp.**, San Francisco, Calif. $1,643,532. 429,000 cases of cream style corn. Defense Personnel Support Center, Philadelphia, Pa.

—**Richard Wynn Interprises**, Knoxville, Tenn. $1,389,733. 285,950 cotton poplin, wind-resistant men's coats. Defense Personnel Support Center, Philadelphia, Pa.

16—**Magline, Inc.**, Pinconning, Mich. $2,629,142. 6,196 section frames for maintenance tents. Defense Personnel Support Center, Philadelphia, Pa.

—**Sierra Engineering Co.**, Sierra Madre, Calif. $1,283,865. 15,060 combat vehicle crewman's helmets. Defense Personnel Support Center, Philadelphia, Pa.

19—**Trenton Textile Engineering & Mfg. Co.**, Trenton, N.J. $2,543,736. 211,987 men's wet weather parkas. Defense Personnel Support Center, Philadelphia, Pa.

20—**Stromberg-Carlson Corp.**, Ardmore, Okla. $3,666,000. 15,600 small general purpose tents. Defense Personnel Support Center, Philadelphia, Pa.

21—**Sands Fashions**, Brooklyn, N.Y. $1,401,140. 34,000 men's wool gabardine overcoats with removeable liner. Defense Personnel Support Center, Philadelphia, Pa.

22—**Delta Petroleum Co.**, New Orleans, La. $2,052,892. 4,825,495 gallons of lubricating oils. Defense Fuel Supply Center, Alexandria, Va.

—**Paulis Silk Co.**, Central Falls, R.I. $1,339,556. 398,508 packages of cotton elastic bandages. Defense Personnel Support Center, Philadelphia, Pa.

23—**Valley Metallurgical Processing Co.**, Essex, Conn. $3,361,273. 4,463,700 pounds of magnesium powder. Defense General Supply Center, Richmond, Va.

—**Eli Lilly & Co.**, Indianapolis, Ind. $1,177,998. 320,856 bottles of propoxyphene hydrochloride. Defense Personnel Support Center, Philadelphia, Pa.

27—**Cities Service Oil Co.**, New York City, N.Y. $2,034,949. 21,420,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Sinclair Refining Co.**, New York City, N.Y. $1,474,200. 15,120,000 gallons of JP–4 jet fuel. Defense Fuel Support Center, Alexandria, Va.

—**Leonard Refineries**, Alma, Mich. $1,011,232. 10,000,000 gallons of JP–4 jet fuel. Defense Fuel Supply Center, Alexandria, Va.

—**Mobil Oil Corp.**, New York City, N.Y. $3,609,211. Fuel oil and gasoline to be delivered to various installations in Arizona, California, Nevada, Oregon and Washington. Defense Fuel Supply Center, Alexandria, Va.

28—**Rubber Fabricators**, Grantsville, W. Va. $2,418,880. 302,360 pneumatic mattresses. Defense Personnel Support Center, Philadelphia, Pa.

—**Delta Mfg. Co.**, Conauga, Tenn. $1,028,495. 6,500 tent liners. Defense Personnel Support Center, Philadelphia, Pa.

—**Pioneer Bag Co.**, Kansas City, Mo. $2,471,000. 10,000,000 polypropylene sandbags. Defense General Supply Center, Richmond, Va.

—**Chase Bag Co.**, New York City, N.Y. $1,230,300. 5,000,000 polyprophylene sandbags. Defense General Supply Center, Richmond, Va.

29—**Stauffer Chemical Co.**, New York City, N.Y. $1,189,679. 287,501 gallons of aircraft turbine engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va.

—**Royal Lubricants Co.**, Hanover, N.J. $1,000,000. 287,501 gallons of aircraft turbine engine lubricating oil. Defense Fuel Supply Center, Alexandria, Va.

—**Otis Elevator Co.**, Cleveland, Ohio. $1,072,377. 231 gasoline-powered fork lift trucks. Defense General Supply Center, Richmond, Va.

ARMY

1—**Guy H. James Construction Co.**, Oklahoma City, Okla. $2,223,516. Work on the Keystone Project on the Arkansas River. Engineer Dist., Tulsa, Okla.

—Frankford Arsenal, Philadelphia, Pa., has awarded the following contracts for metal parts for 20mm cartridges:

Galion Amco, Galion, Ohio. $1,901,696; **Supreme Products Corp.**, Chicago, Ill. $2,411,475; **Newal, Inc.**, Waltham, Mass. $1,176,100; **Z-D Products**, El Segundo, Calif. $3,523,000.

2—**Quiller Construction Co.**, Los Angeles, Calif. $1,566,400. Construction of a 24-bed Army Hospital at Fort Irwin, Barstow, Calif. Engineer Dist., Los Angeles, Calif.

—**Kollsman Instrument Corp.**, Elmhurst, N.Y. $2,142,000. Booster assemblies and metal parts for 75 and 155mm shells. Bridgeport, Conn. Procurement Detachment, New York City, N.Y.

—**General Time Corp.**, LaSalle, Ill. $3,606,750. Fuzes for 105mm projectiles. LaSalle. Frankford Arsenal, Philadelphia, Pa.

CONTRACT LEGEND

Contract information is listed in the following sequence: Date—Company—Value—Material or work to be Performed—Location of Work Performed—Contracting Agency.

—**Eureka Williams Co.**, Bloomington, Ill. $1,964,539. Metal parts for mechanical time fuzes. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Liles Construction Co.**, Montgomery, Ala. $3,248,299. Rehabilitation of barracks and facilities at Fort Polk, La. Engineer Dist., Fort Worth, Tex.

5—**Federal Laboratories**, Saltsburg, Pa. $1,453,332. Hand grenades. Saltsburg. Edgewood Arsenal, Md.

—**General Time Corp.**, LaSalle, Ill. $1,242,331. 2.75-inch rocket fuzes. LaSalle. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Harvey Aluminum**, Torrance, Calif. $4,524,240. 20mm cartridge components. Torrance. Frankford Arsenal, Philadelphia, Pa.

—**Mohawk Rubber Co.**, Akron, Ohio. $2,455,671. Pneumatic tires for 1½-ton, 5-ton and 12-ton vehicles. Akron. Army Tank Automotive Center, Warren, Mich.

—**Mansfield Tire & Rubber Co.**, Mansfield, Ohio. $1,417,758. Pnuematic tires for 1½-ton, 5-ton and 12-ton vehicles. Mansfield. Army Tank Automotive Center, Warren, Mich.

6—**Soule Construction Co.**, Pensacola, Fla. $1,665,693. Work on the Cross Florida Barge Canal Project. Eureka, Fla. Engineer Dist., Jacksonville, Fla.

—**Harvey Aluminum Sales**, Torrance, Calif. $3,171,439. Classified items. Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Bell Aerospace Corp.**, Fort Worth, Tex. $2,417,184. Door assemblies for UH–1 aircraft. Fort Worth. Army Aviation Materiel Command, St. Louis, Mo.

8—**Firestone Tire & Rubber Co.**, Akron, Ohio. $1,117,377. Shoe assemblies for armored personnel carriers. Noblesville, Ind. Army Tank Automotive Center, Warren, Mich.

—**Ford Motors**, Dearborn, Mich. $4,965,235. ½-ton utility trucks. Highland Park, Mich. General Purpose Vehicle Project Manager, Warren, Mich.

9—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $1,361,108. 10,000-gallon capacity collapsible fabric tank assemblies for petroleum. Litchfield Park, Ariz. Army Mobility Equipment Command, St. Louis, Mo.

—**Studebaker Corp.**, Minneapolis, Minn. $1,620,215. Generator sets. Minneapolis. Army Mobility Equipment Command, St. Louis, Mo.

—**Firestone Tire & Rubber Co.**, Akron, Ohio. $4,231,854. Shoe assemblies for tank recovery vehicles. Noblesville, Ind. Tank Automotive Center, Warren, Mich.

—**Grumman Aircraft Engineering Corp.**, Bethpage, N.Y. $2,007,500. OV–1C (Mohawk) aircraft related data reports and ground support equipment. Bethpage. Army Aviation Materiel Command, St. Louis, Mo.

—**Mine Safety Appliances Co.**, Pittsburgh, Pa. $28,926,540. M17A1 field masks. Esmond, R.I. Edgewood Arsenal, Md.

—**General Tire & Rubber Co.**, Akron, Ohio. $1,346,307. Assembly of 750-pound bomb body parts, and fin assemblies for 1,000-pound bombs. Muncie, Ind. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Dynamics**, Rochester, N.Y. $2,594,312. Radio teletypewriter sets. Rochester. Army Electronics Command, Philadelphia, Pa.

12—**Standard Container Co.**, Montclair, N.J. $2,774,250. M2A1 ammunition boxes. Homerville, Ga. Frankford Arsenal, Philadelphia, Pa.

—**Harvey Aluminum, Inc.**, Torrance, Calif. $3,973,900. 20mm target practice projectiles. Torrance. Frankford Arsenal, Philadelphia, Pa.

—**Baifield Industries**, Carrolton, Tex. $2,950,145. Bomb dispensers, shipping and storage containers. Carrolton. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Continental Motors**, Muskegon, Mich. $5,374,131. Standard military engines. Milwaukee, Wis. Mobility Equipment Command, St. Louis, Mo.

—**General Electric**, Burlington, Vt. $1,626,650. 7.62mm aircraft machine guns and components. Burlington. Army Weapons Command, Rock Island, Ill.

—**International Terminal Operating Co.**, New York City, N.Y. $8,895,787. Stevedoring services. Bayonne, N.J. Procurement Office, Eastern Area, Military Traffic Management and Terminal Service, Brooklyn, N.Y.

13—**Northrop-Carolina, Inc.**, Asheville, N.C. $2,440,971. Riot hand grenades. Buncombe City, N.C. Edgewood Arsenal, Md.

—**General Motors**, Detroit, Mich. $1,827,476. Diesel engines, six cylinder, V-type, 210-horsepower, for the Personnel Carrier Tank Recovery Vehicle and Hawk Loader. Detroit. Army Tank Automotive Center, Warren, Mich.

14—**General Motors**, Detroit, Mich. $2,045,904. Work on Phase III Development of the U.S.-F.R.G. Main Battle Tank Project. Warren, Mich. Army Tank Automotive Center, Warren, Mich.

—**Penland Paper Converting Corp.**, Hanover, Pa. $2,046,000. Fiber ammunition containers for 105mm shells. Hanover. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**United Ammunition Container, Inc.**, Philadelphia, Pa. $1,077,250. Fiber ammunition containers for 155mm shells. Philadelphia. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Pace Corp.**, Memphis, Tenn. $1,756,785. Flares. Camden, Ark. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**AVCO Corp.**, Richmond, Ind. $1,912,296. Fuzes for 2.75-inch rockets. Richmond. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Canadian Commercial Corp.**, Ottawa, Canada. $2,909,535. Utility helicopter engines. Longueuil, Quebec. Army Aviation Materiel Command, St. Louis, Mo.

—**Motorola, Inc.**, Chicago, Ill. $2,465,000. Metal parts for artillery ammunition shells. Elk Grove Village, Ill. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Raymond Engineering Laboratories**, Middleton, Conn. $2,759,392. Fabrication of assemblies for rocket proximity fuzes. Middleton. Harry Diamond Laboratory, Washington, D.C.

15—**Norris Industries**, Vernon, Calif. $4,068,113. Metal canisters for mine systems. Brockton, Mass. and Vernon, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Martin Marietta Corp.**, Orlando, Fla. $2,067,999. Metal canisters for mine systems. Orlando. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Catalyst Research Corp.**, Baltimore, Md. $1,342,671. Fabrication of power supplies for rocket proximity fuzes. Baltimore. Harry Diamond Laboratory, Washington, D.C.

—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $1,651,125. Pneumatic tires for trucks and trailers. Akron. Army Tank Automotive Center, Warren, Mich.

16—**Norris Industries**, Los Angeles, Calif. $12,863,086. 105mm cartridge cases. Riverbank, Calif. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Sperry Rand Corp.**, New York City, N.Y. $6,293,098. Ammunition, components for ammunition and for operation and maintenance activities at Louisiana Army Ammunition Plant, Shreveport, La. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Holston Defense Corp.**, Kingsport, Tenn. $19,134,368. Explosives. Kingsport. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Stone Container Corp.**, Chicago, Ill. $1,081,125. Fiber containers for 105mm ammunition. Chicago. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Martin Marietta**, Orlando, Fla. $1,656,755. Components for mines and for loading of mine systems. Orlando. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**AVCO Corp.**, Stratford, Conn. $1,318,949. Technical publication in support of T53 and T55 aircraft engines. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—**Grumman Aircraft Engineering Corp.**, Bethpage, L.I., N.Y. $9,427,102. OV–1 aircraft, related testing, data, ground support equipment, publications and long lead time for the second increment period. Bethpage and Stuart, Fla. Army Aviation Materiel Command, St. Louis, Mo.

—**Philco Ford Corp.**, Newport Beach, Calif. $1,209,983. Repair parts for the M75 grenade launcher used on UH–1B helicopters. Newport Beach. Army Weapons Command, Rock Island, Ill.

19—**Continental Motors**, Muskegon, Mich. $6,409,620. 1½, 3 and 6 horse power engines. Milwaukee, Wis. Army Mobility Equipment Command, St. Louis, Mo.

—**General Instrument Corp.**, Hicksville, N.Y. $1,500,000. Classified electronic equipment. Hicksville. Army Electronics Command, Fort Monmouth, N.J.

—**General Motors**, Cleveland, Ohio. $2,514,375. Conversion kits to accomodate the 20mm rapid fire weapons system to the M114A1 vehicle. Cleveland. Army Weapons Command, Rock Island, Ill.

—**Zeller Corp.**, Defiance, Ohio. $3,370,932. Metal parts for 20mm projectiles. Defiance. Frankford Arsenal, Philadelphia, Pa.

—**Canadian Commercial Corp.**, Ottawa, Canada. $1,150,609. Ammunition propellant. Montreal, Canada. Frankford Arsenal, Philadelphia, Pa.

—**Polarod Electronics Corp.**, Long Island City, N.Y. $1,666,974. Signal generators and maintenance support items for radio sets. Long Island City. Army Electronics Command, Philadelphia, Pa.

20—**American Hoist & Derrick Co.**, St. Paul, Minn. $11,076,371. 20-ton wheel mounted cranes. Fort Wayne, Ind. Army Mobility Equipment Command, St. Louis, Mo.

—**National Union Electric**, Bloomington, Ill. $4,112,500. Bomb components and assemblies. Bloomington. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Redmanson Corp.**, York, Pa. $1,263,298. Air conditioners of various sizes. York. Army Mobility Equipment Command, St. Louis, Mo.

—**Bendix Corp.**, Teterboro, N.J. $1,971,255. NB–1 altitude indicators for multiple aircraft. Teterboro. Army Aviation Command, St. Louis, Mo.

—**Automatic Electronic Co.**, North Lake, Ill. $1,106,597. Items to be used for Autovon PABX equipment. North Lake. Army Electronics Command, Fort Monmouth, N.J.

—**Page Communications Engineers**, Washington, D.C. $2,054,770. Micro wave interconnect links within the Integrated Wide-Band Communications Systems. Southeast Asia. Army Electronics Command, Fort Monmouth, N.J.

21—**City of Jacksonville, Fla.** $1,200,000. Purchase of one used floating power plant. Engineer Dist., Jacksonville, Fla.

—**Mike Bradford & Co.**, Miami, Fla. $1,186,426. Work on the J. Percy Priest Dam & Reservoir, Davidson County, Tenn. Engineer Dist., Nashville, Tenn.

—**AVCO Corp.**, Stratford, Conn. $8,116,200. T–35 engines. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—**Continental Motors**, Muskegon, Mich. $3,784,260. LD–465–1 multi-fuel engines as spare parts for 2½-ton trucks. Muskegon. General Purpose Vehicle Project Manager, Warren, Mich.

22—**Delaware Valley Armament, Inc.**, Cherry Hill, N.J. $2,645,000. Metal parts assemblies for artillery ammunition. Cherry Hill. Procurement Detachment, New York City, N.Y.

—**Brad's Machine Products, Inc.**, Gadsden, Ala. $2,700,000. Metal parts assemblies for artillery ammunition. Gadsden. Procurement Detachment, New York City, N.Y.

—**Lear Siegler, Inc.**, Anaheim, Calif. $2,680,000. Metal parts assemblies for artillery ammunition. Anaheim. Procurement Detachment, New York City, N.Y.

—**L. T. Industries**, Dallas, Tex. $1,480,280. Fin assemblies for the 750-lb. bomb. Garland, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**R. G. LeTourneau**, Longview, Tex. $1,559,397. Fin asemblies for the 750-lb. bomb. Longview. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Ploron Products**, New Rochelle, N.Y. $1,599,445. Fin assemblies for the 750-lb. bomb. Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Dynamics Corporation of America**, Garden City, N.Y. $1,015,681. Fabrication of electronics heads for M414A1 rocket fuzes. Garden City. Harry Diamond Laboratories, Washington, D.C.

—**Kaiser Jeep Corp.**, Toledo, Ohio. $2,169,870. Partial assembly kits for one-ton cargo trucks. Toledo. Army Tank Automotive Center, Warren, Mich.

—**Pacific Car & Foundry**, Renton, Wash. $3,349,810. XM–733 modified assault vehicles. Renton. Army Tank Automotive Center, Warren, Mich.

—**Pacific Car & Foundry**, Renton, Wash. $1,068,470. 40-ton railway refrigerator cars. Renton. Army Mobility Equipment Command, St. Louis, Mo.

—**Pettibone-Mulliken Corp.**, Washington, D.C. $3,094,000. Fork-lift trucks. Chicago, Ill. Army Mobility Equipment Command, St. Louis, Mo.

—**RCA**, Camden, N.J. $5,000,000. Classified electronics equipment. Camden. Army Electronics Command, Fort Monmouth, N.J.

23—**General Motors**, Indianapolis, Ind. $4,200,580. Transmission assemblies. Indianapolis. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Detroit, Mich. $31,940,659. Metal parts for 105mm projectiles. St. Louis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**R. C. Can Co.** Hazelwood, Mo. $1,305,458. 105mm ammunition containers. Hazelwood. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Motors**, Detroit, Mich. $1,025,109. Diesel engines for 155mm howitzers. Detroit. Army Tank Automotive Center, Warren, Mich.

—**Akwa-Downey Construction Co.**, Milwaukee, Wis. $6,592,295. Work on a vehicle assembly building at Kennedy Space Center, Merrett Island, Fla. Canaveral Engineer Dist., Merritt Island, Fla.

—**Levinson Steel Co.**, Pittsburgh, Pa. $3,860,025. Metal parts for 105mm projectiles. Hays, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.

27—**Odom Construction Co.**, Nashville, Tenn. $2,931,818. Work on Kentucky Highway No. 15 at the Carr Fork Reservoir Project. Hazark, Ky. Engineer Dist., Louisville, Ky.

—**Colt's Inc.**, Hartford, Conn. $6,908,750. XM16E1 and M16 rifles (5.56mm). Hartford. Army Weapons Command, Rock Island, Ill.

—**Cessna Aircraft Co.**, Wichita, Kan. $3,156,896. Bombs with dispensers and shipping and storage containers. Wichita. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Technical Operations, Inc.**, Burlington Mass. $2,361,400. 1,190 man months of scientific and technical effort in support of studies, analysis and evaluations for the Combat Development Command, Fort Belvoir, Va. Fort Belvoir. Northwest Procurement Agency, Oakland, Calif.

28—**Arvin Industries**, Columbus, Ind. $1,042,781. Radio sets. Columbus. Army Electronics Command, Philadelphia, Pa.

—**Continental Motors**, Muskegon,Mich. $1,012,937. Multi-fuel engines for 5-ton trucks. Muskegon. Project Manager, General Purpose Vehicles, Warren, Mich.

—**Cessna Aircraft Co.**, Wichita,Kan. $1,262,761. Bomb dispensers and containers for dispenser equipment. Wichita. Procurement Detachment, Chicago, Ill.

—**Remington Arms Co.**, Bridgeport, Conn. $49,299,208. Miscellaneous small arms ammunition. Independence, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Day & Zimmerman, Inc.**, Philadelphia, Pa. $4,241,562. Miscellaneous ammunition components. Texarkana, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Thiokol Chemical Corp.**, Bristol, Pa. $22,981,868. Assembling, loading and packing of ordnance items. Marshall, Tex. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Harvey Aluminum Sales**, Torrance, Calif. $3,147,406. Loading, assembling and packing of miscellaneous medium caliber ammunition and components. Milan, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Federal Cartridge Corp.**, Minneapolis, Minn. $7,862,411. Production of 7.62mm ball ammunition and for operation and maintenance activities. Minneapolis. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Airport Machining Corp.**, Martin, Tenn. $1,803,730. Metal parts for 2.75-inch rockets. Union City, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**American Mfg. Co. of Tex.**, Fort Worth, Tex. $1,972,000. Components for 2.75-inch rockets. Fort Worth. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Polan Industries**, Huntington, W. Va. $1,235,682. Periscopes. Huntington. Frankford Arsenal, Philadelphia, Pa.

29—**Honeywell, Inc.**, Hopkins, Minn. $3,265,252. Fuzes. New Brighton, Minn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**UMC Industrials, Inc.**, Goodyear, Ariz. $1,038,960. Smoke grenades. Goodyear. Edgewood Arsenal, Md.

—**Texas Instrument, Inc., Dallas, Tex.** $7,000,000. Classified electronic equipment. Dallas. Army Electronics Command, Fort Monmouth, N.J.

—**Anthony Co.**, Streator, Ill. $4,690,331. 160 diesel engine driven, fork lift trucks. Streater. Army Mobility Equipment Command, St. Louis, Mo.

30—**Hamilton Watch Co.**, Lancaster, Pa. $5,106,443. 105mm cartridge fuzes. Lancaster, Frankford Arsenal, Philadelphia, Pa.

—**Martin Marietta**, Orlando, Fla. $5,139,909. Continuation of industrial engineering support for the Pershing weapon system. Orlando. Army Missile Command, Redstone Arsenal, Huntsville, Ala.

—**Raytheon Co.**, Norwood, Mass. $2,222,000. 408 telephone signal converters with repair parts and 400 telephone signal converters, less chassis and with a different cable assembly, and with concurrent repair parts and ancillary items. North Dighton, Mass. Army Electronics Command, Philadelphia, Pa.

—**Packard Bell Electronics Corp.**, Newbury Park, Calif. $1,553,000. 472 transponder test sets. Newbury Park. Southwest Procurement Agency, Pasadena, Calif.

—**Fairchild Hiller Corp.**, Hagerstown, Md. $3,412,836. Transmissions for H–23 helicopters. Hagerstown. Army Aviation Materiel Command, St. Louis, Mo.

—**LTV Electro Systems**, Greenville, S.C. $1,597,100. Development, prototyping and manufacturing of modification kits for an Avionics Retrofit Project for U–1, 6 and 8 fixed-wing aircraft. Greenville. Army Aviation Materiel Command, St. Louis, Mo.

—**United Aircraft, Pratt & Whitney Div.**, East Hartford, Conn. $3,054,009. Engine generators for CH–54A aircraft. East Hartford. Army Aviation Materiel Command, St. Louis, Mo.

—**United Aircraft, Sikorsky Div.**, Stratford, Conn. $1,617,099. CH–54A transmission assemblies and main rotor asemblies. Stratford. Army Aviation Materiel Command, St. Louis, Mo.

—**United Aircraft, Hamilton Standard Div.**, Windsor Locks, Conn. $1,648,288. Propellers for OV–1 Mohawk aircraft. $2,653,530. OV–1 propeller controls. Windsor Locks. Army Aviation Materiel Command, St. Louis, Mo.

—**National Gypsum Co.**, Buffalo, N.Y. $16,844,000. Reactivation of facilities for production of ordnance items at the Kansas Army Ammunition Plant, Parsons, Kan. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Bulova Watch Co.**, Jackson Heights, N.Y. $1,120,500. Fuzes for the 81mm mortar. Jackson Heights. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Stewart-Warner Corp.**, Chicago, Ill. $1,022,958. Mine fuzes. Chicago. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Farmer's Chemical Associates, Inc.**, Tyner, Tenn. $1,468,781. Support services for the manufacture of explosives. Chattanooga, Tenn. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Motors**, Detroit, Mich. $1,370,000. Reactivation of support utilities at the Army Ammunition Plant, St. Louis, Mo. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Hercules, Inc.**, Wilmington, Del. $4,537,763. Miscellaneous propellants and explosives, and for operation and maintenance activities at the Army Ammunition Plant, Radford, Va. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Chamberlain Corp.**, Scranton, Pa. $5,020,628. 175mm projectiles. Army Ammunition Plant, Scranton, Pa. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Atlantic Research Corp.**, Alexandria, Va. $1,634,380. Metal parts for mine canisters. Alexandria. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**Donovan Construction Co.**, St. Paul, Minn. $7,918,125. Metal parts for 155mm projectiles. St. Paul. Ammunition Procurement & Supply Agency, Joliet, Ill.

—**General Motors**, Detroit, Mich. $6,527,092. 4,400 four-door, six-passenger, commercial sedans. Wilmington, Del. Army Tank Automotive Center, Warren, Mich.

—**General Motors**, Detroit, Mich. $1,830,720 1,028 commercial station wagons. Detroit. Army Tank Automotive Center, Warren, Mich.

NAVY

1—**Vocaline Company of America**, Old Saybrook, Conn. $1,093,346. Work on preproduction, production and engineering testing for quality control of sonobuoys and underwater sound signals. South Bristol, Maine. Naval Air Systems Command.

—**Lockheed Aircraft Corp.**, Burbank, Calif. $1,951,500. Modification of government owned SP–2H aircraft. Burbank. Naval Air Systems Command.

—**Western Electric**, New York City, N.Y. $1,000,000. MK 1 Mod O weapons direction equipment. Burlington, N.C. Naval Ordnance Systems Command.

—**Skagit Corp.**, Sedro Woolley, Wash. $1,951,630. Winches to be used aboard fast combat support ships. Puget Sound Naval Shipyard, Bremerton, Wash.

2—**Garrett Corp., AiResearch Div.**, Phoenix, Ariz. $11,626,329. T76–G–10/12 engines for OV–10A aircraft. Phoenix. Naval Air Systems Command.

—**Lockheed Aircraft Corp.**, Burbank, Calif. $7,380,000. Long leadtime effort and materials to support FY 67 procurement of P–3B aircraft. Burbank. Naval Air Systems Command.

—**Merando, Inc.**, Washington, D.C. $1,818,300. Construction of a station hospital and dental clinic at the Naval Air Training Center, Patuxent River, Md. Chesapeake Div., Naval Facilities Engineering Command.

—**Western Electric**, New York City, N.Y. $1,051,892. Sonar equipment for submarines. Burlington, N.C. Naval Ship Systems Command.

—**North American Aviation**, Columbus, Ohio. $1,700,000. Condor missiles. Columbus. Naval Air Systems Command.

5—**United Aircraft**, East Hartford, Conn. $1,352,000. J60–P–6 engines for aircraft. East Hartford. Naval Air Systems Command.

—**United Aircraft**, East Hartford, Conn. $1,935,815. Model J75–P–13B engines for the Air Force. East Hartford. Naval Air Systems Command.

—**Johns Hopkins University, Applied Physics Laboratory**, Silver Spring, Md. $1,640,000. Work on the Bumblebee project. Silver Spring. Naval Ordnance Systems Command.

—**General Dynamics**, Pomona, Calif. $3,420,000. Guidance, control and ordnance sections for Type I standard missiles. Pomona. Naval Ordnance Systems Command.

—**Monsanto Research Corp.**, St. Louis, Mo. $2,000,000. Research on high performance composite materials. St. Louis. Office of Naval Research, Washington, D.C.

6—**National Co.**, Melrose, Mass. $7,557,327. Radio transmitters for shore communications. Melrose. Navy Purchasing Office, Washington, D.C.

AAI Corp., Baltimore, Md. $2,061,341. Missile handling systems to be used aboard fast combat support ships. Cockeysville, Md. Puget Sound Naval Shipyard, Bremerton, Wash.

—**Boeing Co.**, Seattle, Wash. $1,120,000. Research on the stress corrosion cracking of high strength metals. Seattle. Office of Naval Research, Washington, D.C.

—**Hewlett-Packard Co.**, Rockville, Md. $1,674,800. Oscilloscopes. Colorado Springs, Colo. Naval Ship Systems Command.

8—**Baldwin-Lima-Hamilton Corp.**, Philadelphia, Pa. $1,227,360. Ship propellers. Philadelphia. Naval Ship Systems Command.

—**United Aircraft**, Norwalk, Conn. $2,037,973. Display systems and associated equipment for submarines. Norwalk. Naval Ship Systems Command.

—**United Aircraft**, East Hartford, Conn. $1,758,892. Overhaul equipment for J–75 aircraft engines. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.

—**Westinghouse Electric**, Pittsburgh, Pa. $5,129,000. Navy nuclear-propulsion components. Pittsburgh. Naval Ship Systems Command.

9—**Northrop Corp.**, Newbury Park, Calif. $1,095,315. MQM–36A aerial targets. Newbury Park. Naval Air Systems Command.

—**Bermite Powder Co.**, Saugus, Calif. $9,965,644. Aircraft parachute flares. Saugus. Navy Ships Parts Control Center, Mechanicsburg, Pa.

12—**Martin-Marietta Corp.**, Baltimore, Md. $1,225,464. Systems engineering and avionics design for an accelerated P–2 aircraft program. Baltimore. Navy Air Development Center, Johnsville, Pa.

—**Hazeltine Corp.**, Little Neck, N.Y. $2,374,757. Air droppable acoustic devices. Little Neck. Navy Air Development Center, Johnsville, Pa.

—**Sperry Rand Corp.**, Great Neck, N.Y. $2,369,584. Engineering effort to perform a development program on the Terrier radar set, and ancillary equipment. Great Neck. Naval Ordnance Systems Command.

—**AVCO Corp.**, Stratford, Conn. $1,307,513. Spare parts for A4E aircraft. Stratford. Navy Aviation Supply Office, Philadelphia, Pa.

13—**United Aircraft, Pratt & Whitney Aircraft Div.**, East Hartford, Conn. $22,404,955. J52–P–8A engines. East Hartford. Naval Air Systems Command.

—**Curtis-Wright Corp.**, Wood-Ridge, N.J. $8,484,601. Spare parts for aircraft engines. Wood-Ridge. Navy Aviation Supply Office, Philadelphia, Pa.

14—**Willamette Iron & Steel Co.**, Portland, Ore. $2,431,000. Overhaul of the oiler USS Cacapon (AO–52). Portland. Industrial Manager, 13th Naval Dist.

—**Newport News Shipbuilding & Drydock Co.**, Newport News, Va. $1,000,000. Overhaul and refueling of the ballistic missile submarine USS Lafayette (SSBN–616). Newport News. Naval Ship Systems Command.

—**Aerojet General Corp.**, Sacramento, Calif. $2,908,456. Manufacture of Sparrow missiles. Sacramento. Naval Ordnance Stations, Indian Head, Md.

—**General Dynamics**, Pomona, Calif. $1,414,800. Study program on an antisubmarine warfare ship integrated combat system. Pomona. Naval Ship Systems Command.

15—**Blass Antenna Electronics Corp.**, Long Island City, N.Y. $1,050,000. Work on phased array radar aboard naval ships. Long Island City. Naval Ship Systems Command.

—**General Dynamics**, Pomona, Calif. $3,500,000. Research and development on the Standard Arm Missile. Pomona. Naval Air Systems Command.

—**Grumman Aircraft Engineering Corp.**, Bethpage, L.I., N.Y. $5,207,000. TC–4C aircraft. Bethpage. Naval Air Systems Command.

—**Hughes Tool Co.**, Culver City, Calif. $3,734,862. 20mm gun pods. Culver City. Naval Air Systems Command.

—**General Electric**, Schenectady, N.Y. $1,123,000. Refurbishment of nuclear propulsion components. Schenectady, N.Y. Naval Ship Systems Command.

—**J.A. Jones Construction Co.**, Memphis, Tenn. $3,620,000. Construction of an enlisted mens barracks at the Naval Air Station, Memphis, Tenn. Southeast Div., Naval Facilities Engineering Command.

16—**Boeing Co.**, Morton, Pa. $7,680,000. CH–46D helicopters. Morton. Naval Air Systems Command.

—**Bromfield Corp., United Shipbuilding Div.**, East Boston, Mass. $1,690,354. Topside repairs on the auxiliary oiler USS Allagash (AO–97). East Boston. Superviser of Shipbuildings, 1st Naval Dist.

—**John Trumpy & Sons**, Annapolis, Md. $5,299,470. Construction of six Fast Patrol Boats. Annapolis. Naval Ship Systems Command.

—**M.I.T.**, Cambridge, Mass. $2,000,000. Tactical engineering support for the Polaris guidance system. Cambridge. Special Projects Office.

—**General Electric**, Syracuse, N.Y. $1,297,745. Modification of a development model of a communication system for shipboard use. Syracuse. Naval Ships Systems Command.

19—**Radiation, Inc.**, Melbourne, Fla. $3,392,378. Digital data communication sets for Navy aircraft. Melbourne. Naval Air Systems Command.

20—**United Aircraft**, East Hartford, Conn. $4,069,322. Spare parts to support turbo-jet engines used on various attack and fighter aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.

—**United Aircraft**, East Hartford, Conn. $3,071,439. Spare parts to support the TF30–P8 engine used on A–7B aircraft. East Hartford. Navy Aviation Supply Office, Philadelphia, Pa.

22—**Curtiss Wright Corp.**, Wood-Ridge, N.J. $2,743,951. Spare parts for R1820 radial arrangement engines used on various aircraft. Wood-Ridge. Navy Aviation Supply Office, Philadelphia, Pa.

—**General Electric**, West Lynn, Mass. $2,129,505. Spare parts for T–58 engines used in CH–46 and UH–2 aircraft. West Lynn. Navy Aviation Supply Office, Philadelphia, Pa.

—**Bendix Corp.**, Teterboro, N.J. $1,738,960. Components of the PB2ON autopilot system used on P–3A aircraft. Teterboro. Navy Aviation Supply Office, Philadelphia, Pa.

—**Raytheon Co.**, Lexington, Mass. $1,138,753. Sparrow missiles. Lowell, Mass. Naval Air Systems Command.

—**University of Alaska**, College, Alaska. $1,210,000. Services in connection with the operation of the Arctic Research Laboratory. College. Office of Naval Research.

23—**Tracor, Inc.**, Austin, Tex. $2,732,724. Technical services and engineering assistance for the Sonar Systems Project Office of the Naval Ship Systems Command. Washington, D.C. Naval Ship Systems Command.

—**Sea Land Services, Inc.**, Elizabeth, N.J. $7,500,000. Weekly container cargo service from the west coast to the Philippine Islands commencing April 1, 1967. Military Sea Transportation Service.

—**Williams & Burrows**, Belmont, Calif. $1,152,000. Construction of an office building at the Naval Station, Treasure Island, San Francisco, Calif. Western Div., Naval Facilities Engineering Command.

—**University of California**, Berkeley, Calif. $1,108,000. Additional research on the epidemiology of infectious diseases. Berkeley. Office of Naval Research.

27—**McDonnell Aircraft**, St. Louis, Mo. $1,050,000. Wing section assemblies for F–4B aircraft. St. Louis. Navy Aviation Supply Office, Philadelphia, Pa.

—**Washington Aluminum Co.**, Baltimore, Md. $3,679,081. AM2 pallett and mat assemblies for the SAT program. Enterprise, Ala. Naval Air Engineering Center, Philadelphia, Pa.

—**TRW, Inc., Redondo** Beach, Calif. $1,067,140. System analysis of the ASW systems program. Redondo Beach.

—**United Aircraft**, Stratford, Conn. $3,500,000. Helicopters. Stratford. Naval Air Systems Command.

28—**Franklin Institute**, Philadelphia, Pa. $9,300,000. Additional research, study and investigation of problems in naval warfare. Arlington, Va. Office of Naval Research.

—**Treadwell Corp.**, New York City, N.Y. $2,080,000. Oxygen generators. New York City. Naval Ship Systems Command.

—**Texas Instruments**, Dallas, Tex. $1,717,853. Shrike guidance and control sections, and sets of wings and fins. Dallas. Naval Air Systems Command.

—**Lansdowne Steel & Iron Co.**, Morton, Pa. $1,197,787. 5-inch, 38-cal. projectiles. Morton. Navy Ships Parts Control Center, Mechanicsburg, Pa.

—**Martin Marietta**, Orlando, Fla. $1,602,400. Aero 5A–1 missile launchers for installation on A–4 and A–6 aircraft. Orlando. Navy Aviation Supply Office, Philadelphia, Pa.

—**Sperry Rand Corp.**, Bristol, Tenn. $4,425,885. Guidance and control sections, and wing and fin sets for Shrike missiles. Bristol. Naval Air Systems Command.

29—**General Dynamics**, Pomona, Calif. $1,781,900. Testing and checkout of elements of the anti-air warfare systems of the USS Farragut (DLG–6) and the USS Leahy (DLG–16). Philadelphia, Pa., and Norfolk, Va. Naval Ship Systems Command.

30—**Bath Iron Works Corp.**, Bath, Maine. $3,725,000. Advance planning, design, material procurement and prefabrication for the modernization, rehabilitation, repair and outfitting of the destroyers USS Davis (DD–937), USS Jonas Ingram (DD–938) and USS Mullinix (DD–944). Bath. Naval Ship Systems Command.

—**Continental Electronics Mfg. Co.**, Dallas, Tex. and **RF Communications, Inc.**, Rochester, N.Y. $15,311,249. High frequency radio transmitters for use by various shore radio stations. Dallas. Navy Purchasing Office, Washington, D.C.

—**Admiral Corp.**, Chicago, Ill. $6,077,302. Radio sets for use on aircraft. Chicago. Navy Aviation Supply Office, Philadelphia, Pa.

—**Sargent-Fletcher Co.**, El Monte, Calif. $1,382,692. Government furnished air refueling stores. El Monte. Naval Air Systems Command.

MARINE CORPS

21—**Dynamics Corporation of America**, Bridgeport, Conn. $1,896,000. Generator sets. Headquarters, Marine Corps.

—**General Motors**, Hudson, Ohio. $5,307,349. Tractors, power control units, winch attachments and ripper attachments. Headquarters, Marine Corps.

29—**Anthony Co.**, Streater, Ill. $1,142,668. 46 cranes. Streator. Headquarters, Marine Corps.

AIR FORCE

2—**Garrett Corp.**, Torrance, Calif. $2,732,116. Production of computer components for F–4 aircraft. Los Angeles. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—**Lockheed Aircraft**, Sunnyvale, Calif. $1,697,400. Engineering support for the Agena booster system. Sunnyvale. Space Systems Div., (AFSC), Los Angeles, Calif.

—**North American Aviation**, Anaheim, Calif. $4,223,425. $5,980,273. Production of spare parts for Minuteman missiles. Anaheim. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

5—**Applied Technology, Inc.**, Palo Alto, Calif. $1,187,500. Production of airborne electronic equipment for B–52 aircraft. Palo Alto. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**General Motors**, Indianapolis, Ind. $2,394,201. Modification of Canadian CC–109 cargo aircraft under the Military Assistance Program. Indianapolis. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—**Sanders Associates**, Nashua, N.H. $4,655,000. Production of ground communications equipment. Nashua. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

6—**General Electric**, West Lynn, Mass. $4,991,400. Production of J–85 engines for the AT–37 aircraft. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Electric**, West Lynn, Mass. $7,336,000. Development program for T–64–12 engines for helicopters. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Fairchild Camera & Instrument Corp.**, Syosset, N.Y. $1,378,743. Production of LS–58A camera mounts, spare parts and data. Syosset. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Continental Aviation & Engineering Corp.**, Detroit, Mich. $1,404,500. Modification of T–56 turboshaft engines. Detroit. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

7—**Douglas Aircraft Co.**, Santa Monica, Calif. $2,264,400. Design, development and fabrication of TItan III space booster components. Santa Monica. Space Systems Div., (AFSC), Los Angeles, Calif.

—**Applied Technology Co.**, Palo Alto, Calif. $1,081,536. Production of communication equipment for F–105 aircraft. Palo Alto. Warner Robins Air Materiel Area, (AFLC), Robins, AFB, Ga.

8—**Consolidated Diesel Electric Co.**, Stamford, Conn. $2,915,140. Production of gas turbine generators. Stockton, Calif. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

—**General Electric**, Philadelphia, Pa. $1,540,000. Re-entry vehicle flight test program. Philadelphia. Ballistics Systems Div., (AFSC), Norton AFB, Calif.

—**General Electric**, Philadelphia, Pa. $1,600,000. Work on the Mark 12 re-entry vehicle program. Philadelphia. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

9—**Lockheed Aircraft**, Marietta, Ga. $1,213,500. Work on an adverse weather aerial delivery system. Marietta. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Aircraft Hydro Forming, Inc.**, Gardena, Calif. $2,214,022. Production of aircraft pylon bomb rack asemblies for F–105 aircraft. Gardena. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

—**Philco Corp.**, Newport Beach, Calif. $1,650,000. Work on an advanced airborne radar system. Newport Beach. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

12—**Sanders Associates**, Nashua, N.H. $2,811,461. Production of airborne radio direction finding equipment. Nashua. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Eastman Kodak Co.**, Rochester, N.Y. $1,330,316. Production of photographic processing equipment and spare parts. Rochester. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

14—**Goodyear Tire & Rubber Co.**, Akron, Ohio. $2,101,469. Production of wheels and brake assemblies for C–141 aircraft. Akron. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

15—**Oshkosh Motor Truck, Inc.**, Oshkosh, Wis. $1,176,000. Production of 40 aircraft towing tractors. Oshkosh. Warner-Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Lockheed Missiles & Space Co.**, Sunnyvale, Calif. $2,000,000. Production of Agena space vehicles. Sunnyvale. Space Systems Div., (AFSC), Los Angeles, Calif.

—**Douglas Aircraft**, Santa Monica, Calif. $2,500,000. Production of Thor space boosters. Santa Monica. Space Systems Div., (AFSC), Los Angeles, Calif.

—**Aerojet-General Corp.**. Azusa, Calif. $2,855,130. Research and development of an unmanned space technology program. Azusa. Space Systems Div., (AFSC), Los Angeles, Calif.

—**TRW Inc., Systems Group Div.**, Redondo Beach, Calif. $2,855,130. Research and development of an unmanned space technology program. Redondo Beach. Space Systems Div., (AFSC), Los Angeles, Calif.

16—**Hughes Aircraft Co.**, Fullerton, Calif. $18,200,000. Development and production of Tactical Control Operations Centers for the 407L System.. Fullerton. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

19—**Curtiss-Wright Corp.**, Wood-Ridge, N.J. $1,034,447. Production of pistons and cylinder assemblies for R–3350 aircraft engines. Wood-Ridge. San Antonio Air Materiel Area, (AFLC), Kelly AFB, Tex.

—**General Motors**, Indianapolis, Ind. $6,480,000. Production of T–56 turboprop engines and related equipment. Indianapolis. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Sargent-Fletcher Co.**, El Monte, Calif. $7,053,506. Production of fuel tank assemblies for F–4C aircraft. El Monte. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—**Sylvania Electric Products**, Mountain View, Calif. $2,500,000. Production of security subsystems and modification kits for the Minuteman missile. Mountainview and Needham, Mass. Ballistic Systems Div., (AFSC), Norton AFB, Calif.

—**Collins Radio Co.**, Richardson, Tex. $5,861,544. Production and installation of high-frequency single sideband communications facilities. Richardson. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

20—**Giannini Controls Corp.**, Caldwell, N.J. $3,743,006. Production of airborne flight recording instruments. Caldwell. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**U.S. Steel**, Pittsburgh, Pa. $1,400,000. Production of bomb casings. Pittsburgh. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Electric**, Ontario, Calif. $1,040,000. Overhaul and modification of J–79 aircraft engines. Ontario. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

21—**Wyman-Gordon Co.**, Grafton, Mass. $1,883,251. Production of components for a heavy aircraft forming press. Grafton, Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Precision**, Wayne, N.J. $1,992,520. Work on air navigation equipment related to advance strategic aircraft. Wayne. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Fairchild Camera & Instrument Corp.**, Syosset, N.Y. $3,025,209. Production of aircraft cameras. Syosset. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**North American Aviation**, Anaheim, Calif. $1,175,000. Work on radar systems related to advanced strategic aircraft. Anaheim. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Honeywell, Inc.**, Hopkins, Minn. $1,456,010. Production of land mine fuzes. Hopkins. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**General Electric**, Utica, N.Y. $4,000,000. Production of components for airborne electronic systems. Utica. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**North American Aviation**, Tulsa, Okla. $1,902,425. Overhaul and repair of air-to-ground missiles. Tulsa. Oklahoma City Air Materiel Area, (AFLC), Tinker AFB, Okla.

—**North American Aviation**, Anaheim, Calif. $1,051,525. Overhaul and repair of air-to-ground missiles. Anaheim. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—**Atlantic Research Corp.**, Alexandria, Va. $1,072,094. Production of meteorological rockets and motors. Gainesville, Va. Ogden Air Materiel Area, (AFLC), Hill AFB, Utah.

—**Bendix Corp.**, Ann Arbor, Mich. $3,600,900. Production work on an emergency communications system. Ann Arbor. Electronic Systems Div., (AFSC), L. G. Hanscom Field, Mass.

27—**Applied Technology, Inc.**, Palo Alto, Calif. $1,768,305. Production of radar equipment for B–52 aircraft. Palo Alto. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**General Electric**, West Lynn, Mass. $13,017,100. Production of T–58 engines for helicopters. West Lynn. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—M.I.T., Cambridge Mass. $2,489,625. Basic research in intense magnetic fields. Cambridge. Air Force Office of Scientific Research, Washington D.C.

—**Marquardt Corp.**, Van Nuys, Calif. $1,500,000. Supersonic ramjet fllight test program. Van Nuys. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

28—**Ling-Temco Vought**, Greenville, Tex. $5,428,000. Research and development for modification of C–123B aircraft. Greenville. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Stanley Aviation Corp.**, Denver, Colo. $1,317,462. Modification kits for Navy and Air Force A–1 series aircraft. Denver. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

—**Litton Systems**, Woodland Hills, Calif. $3,238,675. Production of electronic equipment for F–4D and F–4E aircraft. Woodland Hills. Oklahoma City Air Material Area, (AFLC), Tinker AFB, Okla.

—**Battelle Memorial Institute**, Columbus, Ohio. $1,000,000. Operation of the Defense Metals Information Center for FY 1967. Columbus. Systems Engineering Group, Research & Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

29—**Boeing Co.**, Wichita, Kan. $1,513,427. B–52 stability augmentation and flight control system evaluation. Wichita. Oklahoma City Air Materiel Area (AFLC), Tinker AFB, Okla.

—**Fairchild Hiller Corp.**, Hagerstown, Md. $1,628,449. Modification of C–123 aircraft. Hagerstown. Warner Robins Air Materiel Area, (AFLC), Robins AFB, Ga.

—**Cessna Aircraft Co.**, Wichita, Kan. $4,500,000. Production of O–2 aircraft, spare parts, aerospace ground equipment and related data. Wichita. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

—**Lockheed Aircraft**, Jamaica, N.Y. $5,392,624. Inspection and repair as necessary of C–121 aircraft. Jamaica. Sacramento Air Materiel Area, (AFLC), McClellan AFB, Calif.

30—**Marquardt Corp.**, Van Nuys, Calif. $2,500,000. Analytical and experimental program to provide technology applicable to hypersonic RAMJET engines. Van Nuys. Systems Engineer Group, Research and Technology Div., (AFSC), Wright-Patterson AFB, Ohio.

—**International Telephone & Telegraph Corp.**, Paramus, N.J. $6,860,373. Production of defense special security communications equipment. Paramus. Electronics Systems Div., (AFSC), L. G. Hanscom Field, Mass.

—**Hycon Mfg. Co.**, Monrovia, Calif. $1,091,000. Production of high altitude aircraft cameras. Monrovia. Aeronautical Systems Div., (AFSC), Wright-Patterson AFB, Ohio.

Red Ball Express Completes First Year

The "Red Ball Express," a special Air Force airlift of priority combat vehicle and aircraft parts to Southeast Asia, has carried almost 9,400 tons of vital cargo to military units in Vietnam since its first flight.

The initial Red Ball flight took off from Travis AFB, Calif., for Saigon on Dec. 8, 1965. It carried only five pieces of "express" cargo, weighing 130 pounds, along with its regular load. During the year a one-day record was reached when 571 pieces, weighing a total of 105 tons, left Travis.

Named for a surface supply line system which used trucks to haul food, equipment and ammunition to the front lines of Europe during World War II, today's Military Airlift Command (MAC) operation hauls only priority parts to keep combat vehicles operating.

In its first year MAC reports its Red Ball Express has carried an average of more than 25 tons per day to Southeast Asia. The overall total of 9,363 tons was moved in 695 missions. The Red Ball aircraft constituted about five percent of the total MAC airlift to Southeast Asia during this period.

AVCOM Assumes Test Activities

Support responsibilities for the Army Aviation Test Activity (ATA) at Edwards AFB, Calif., have been reassigned from the Army Test Evaluation Command to the Army Aviation Command (AVCOM), St. Louis, Mo.

In addition, AVCOM has been assigned responsibilities for the Army element of the tri-service V/STOL team at Edwards which is now engaged in testing the Ling-Temco-Vought XC–142 cargo aircraft.

ATA originally was established in 1960. Subsequently it was assigned to the Test and Evaluation Command, Aberdeen, Md., with the reorganization of Army technical services in the early 1960's.

DEFENSE PRIME CONTRACT AWARDS TO SMALL BUSINESS

Amounts in Thousands

	July–Oct. 1966	July–Oct. 1965
Procurement from All Firms	$13,696,066	$10,133,387
Procurement from Small Business Firms	2,671,302	2,072,309
Percent Small Business	19.5	20.5

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Air Force Flight Control Research May Extend Aircraft Life Span

The U. S. Air Force has contracted for a six million dollar research program to develop an automatic flight control system that could double the useful lifetime of both present and future large, flexible aircraft such as the B–52, XB–70 and C–5A.

Called LAMS (Load Alleviation and Mode Stabilization), the program is being conducted by The Boeing Co.'s Wichita, Kan., division for the Air Force Flight Dynamics Laboratory, Wright-Patterson AFB, Ohio, a unit of the Air Force Systems Command's Research and Technology Division. Robert P. Johannes is the program manager for the laboratory.

The flight control system being sought, already proved feasible in exploratory development, will automatically dampen structural oscilliations and reduce or alleviate stresses from wind gusts and maneuvering loads which cause metal fatigue in aircraft.

The program's goal is to extend aircraft life by 70 to 100 percent with such a system. Beside increasing structural life, the automatic flight control system will increase crew efficiency because of the smoother ride, essential on high-speed, low-level flights; provide a more stable platform to increase accuracy of weapons delivery; and aid development of equipment, techniques and design criteria for future aircraft.

Boeing will install the flight control system, two analog computers, and more than 164 strain gages in a B–52 aircraft to test the flight control techniques' capability to reduce aircraft fatigue in a realistic flight environment.

Preliminary flight tests of the B–52 aircraft are now scheduled to obtain additional information on the airplane while under normal controls. The flight demonstration phase of the automatic control system will begin in the fall of this year and be completed by the summer of 1968. Approximately 35 flights are scheduled.

Sensors will be installed on structural members of the fuselage, wings and tail surfaces in sets of three. If one sensor does not function correctly, the other two will sense the energy of motion or loading applied to the aircraft and transmit it to the computers. A 15-foot long boom on the nose of the B–52 measures wind gusts that buffet the aircraft.

Instrumentation on the test aircraft is valued at $2,500,000.

Army-Air Force Study Combat Hazard

Project WEST (Weapons Exhaust Study), a joint Army and Air Force project, is helping to prevent a potential problem which could affect helicopter crews in combat over Vietnam. Crews evaluating the Army's newer, more heavily armed helicopters, have complained of nausea and dizziness after inhaling thick concentrations of gunpowder and missile propellant fumes created during firing tests.

The Air Force Rocket Propulsion Laboratory at Edwards AFB, Calif., has teamed with the Army Aeromedical Research Unit at Fort Rucker, Ala., to examine the exhaust gases produced by various types of munitions and to determine their exact chemical composition and degree of toxicity.

Utilizing the same equipment and techniques used to evaluate rocket fuels, Project WEST engineers are conducting tests where both gunpowder and missile propellants are burned under laboratory conditions. Tests will also be conducted under field conditions in the Mojave Desert to simulate actual service operations.

Test data gathered by the Rocket Propulsion Laboratory are relayed to the Army Aeromedical Research Unit where other information from in-flight tests is being assembled and evaluated.